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A REVISION OF THE EMBIOPTERA, OR WEB-SPINNERS,
OF THE NEW WORLD

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INTRODUCTION

THE present contribution is intended to be a summary of the systematics of the known Recent and Tertiary species of Embioptera of North and South America. Although the writer has recently revised the North American species (1940b), it seems desirable to include them at this time in the light of new information and the need for describing related new species. The current revision was initiated by the discovery of many new species, as well as genera, in collections sent to the writer for study, and by the availability of supplementary data concerning certain poorly known old species. It is hoped that this paper will attract the attention of field collectors and students to this very interesting, but much neglected, order of insects. The extent of this neglect can best be illustrated by the fact that this study, by reference to only a few small collections, nearly doubles the number of known American species.

The 71 recognizable American species are distributed in 17 genera and 6 families. Except for the genus *Oligotoma* (represented only by 3 introduced species), all genera seem to be endemic to the New World. The Embiidae apparently constitute the only family, except possibly the Oligotomidae (genus *Gynembia* Ross), represented by endemic genera in both the Old and New World. At least two of these genera (*Embolynta* Davis and *Pararhagadochir* Davis) appear

to be closely related to certain Old World genera, as will be discussed later, but otherwise those of the two faunas seem to be very distinct. The other families, Oligembiidae, Anisembiidae, and Teratembidae, are peculiarly American.

Conclusions regarding the geographic distribution and phylogeny of the New World species must await more adequate data. It is interesting to note, however, that in the Clothodidae we have species exhibiting the most generalized structural features of the order, while in the genera *Oligembia* Davis and *Chelicerca* Ross some of the highest specialization occurs. Most of the genera are well defined and are often difficult to relate to one another, but in the Anisembiidae it is possible to trace a serial specialization of generic and specific characters that seems to correlate with a distributional pattern—the more generalized forms being found in tropical South America and the most highly specialized in environments bordering the Sonoran deserts of North America. As evidenced by the fossil record (*Clothoda florissantensis* Cockerell), the order ranged beyond its present limits during the warm periods of the Tertiary. Most of this migration appears to have come from the south, but there is a possibility that during one of these warm periods one species (*Gynembia tarsalis* Ross) came to North America from the Old World, as did so much of its Pacific coast biota, by means of a land bridge in the vicinity of the Bering Strait. This will be more fully discussed hereinafter (p. 497).

References to the South and Central American Embioptera are widely scattered in the literature. Navás (1918) made the only attempt to treat in one paper the South American species, but his concepts have been considerably altered by later workers and by the discovery of many additional species. Davis (1939-40) in his "Taxonomic Notes on the Order Embioptera," has added more than any other one worker to our knowledge of the American Embioptera. His work is made particularly valuable by the fact that he had the opportunity to redescribe and figure the type specimens of many American species.

Before passing to the present treatment it may be well to repeat that the systematics of the order, as they probably always will be, are based almost entirely upon the characters of the mature male. The females are neotenic to a high degree and exhibit few characters. There are as yet no available clear-cut characters that can be used to determine the genus, or even family, of the females or immature specimens. The best means of identifying these is by their definite association with males, although it is possible at times to make determinations by a process of elimination based upon geographic distribution, color, size, and number of hind basitarsal sole-bladders.

Almost without exception the descriptions and figures presented by the writer, as well as by Davis, are made from specimens treated in 10-percent potassium hydroxide, and, after due procedure (Ross, 1940b, p. 634), mounted on slides. Unless this preparation for study is used, many of the minute characters of the abdominal terminalia cannot be seen or be compared on a common basis of interpretation with the results of recent studies wherein such methods were used.

In this revision it has been the practice, where the writer has nothing to add to the knowledge of a species or genus, to cite only the references and the type locality. Most such abbreviated treatments involve species that have already been fully described and illustrated by Consett Davis or the writer.

In the synonymies the asterisks serve to identify the references with the corresponding locality records given in the text following.

GENERAL EXPLANATION OF FIGURES

The drawings are based upon simple camera lucida outlines. Setae, indications of pattern, and relative degree of sclerotization have been omitted. Membranous areas are represented by stippling. In the figures of the head, the mandibles are often shown spread apart; the palpi, terminal antennal segments, and facets of the eyes have been omitted. No attempt has been made to adopt a uniform scale. *Explanation of symbols*: 8=eighth, 9=ninth, 10=tenth abdominal tergites; 10 L=left hemitergite of tenth tergite; 10 R=right hemitergite of tenth tergite; 10 LP=process of 10 L; 10 RP, 10 RP₁, 10 RP₂=processes of 10 R; H=hypandrium or ninth abdominal sternite; HP=process of H; LPPT and RPPT=left and right paraprocts; LCB and RCB=left and right cercusbasipodites; LCB+LPPT=composite left cercus-basipodite and left paraproct; LC₁=basal segment of left cercus. These symbols are the same as those used by Davis except for LPPT and RPPT, which he regards as hemisternites of the tenth sternite (XL and XR).

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Imperial Institute of Tropical Agriculture, St. Augustine, Trinidad (EMcC); F. Plaumann, Nova Teutonia, Brazil; E. C. Van Dyke, California Academy of Sciences; and P. W. Wygodzinsky, Rio de Janeiro, Brazil. The initials enclosed in parentheses following certain names will be used as symbols to give due credit for the source of material. Dr. E. A. Chapin, curator of insects, United States National Museum, very kindly assisted, during the writer's absence from the country, in seeing this paper through the press.

KEY TO NEW WORLD FAMILIES OF EMBIOPTERA (MALES)

1. Mandibles with distinct inner apical dentations----- 2
Mandibles without apical dentations----- Anisembiidae
2. Wings with either R_{2+3} or R_{4+5} forked----- 3
Wings with R_{2+3} and R_{4+5} simple----- Oligotomidae
3. Wings with R_{2+3} simple and R_{4+5} forked----- 4
Wings with R_{2+3} forked and R_{4+5} simple----- Teratembiidae
4. Left cercus without echinulations on inner side----- 5
Left cercus with echinulations on inner side—these usually located on an inner apical nodule----- Embiidae
5. Large sized (15–18 mm.); wings with all veins strongly represented, Cu_{1a} usually multibranching; abdominal terminalia subsymmetrical and unspecialized, processes short----- Clothodidae
Small sized (5–8 mm.); wings with veins (except R_1 , R_{2+3} , and Cu_{1b}) poorly represented, subobsolete, Cu_{1a} simple; abdominal terminalia highly asymmetrical and specialized, processes prominent----- Oligembiidae

Family CLOTHODIDAE

Clothodinae ENDERLEIN, 1909, p. 175 (subfamily of Embiidae); 1912, p. 21.

Clothodidae TILLYARD, 1937, p. 251.—DAVIS, 1940e, p. 536; 1940f, p. 678; 1942, p. 111.

Type genus.—*Clothoda* Enderlein.

Characters and distribution of the single genus.

Genus CLOTHODA Enderlein

Clothoda ENDERLEIN, 1909, p. 176; 1912, p. 21.—NAVÁS, 1918, p. 109 (tribe Clothodinos).—DAVIS, 1939c, p. 373; 1942, p. 111.

Antipaturia ENDERLEIN, 1912, p. 63 (genotype: *A. acquicercata* Enderlein).—NAVÁS, 1918, p. 106.—DAVIS, 1939c, pp. 373, 379 (establishes synonymy).

Males.—Very large, uniformly dark-pigmented. Head large, with eyes relatively small, inflated, facets small, mandibles stout with large, blunt apical dentations, 3 on the left mandible, 2 on the right; mentum obsolete; antennae 23-segmented (?), brown with terminal 5 segments white. Wings dark, with all veins nearly complete to terminus; cross veins numerous; R_{2+3} simple; R_{4+5} forked; M simple; Cu_{1a} simple or with 1 or 2 branches; anal vein well represented, entire. Hind basitarsi with 2 large sole-bladders. Abdominal terminalia simple, subsymmetrical; tenth tergite usually cleft medially, hemiter-

gites subequal, each usually bearing a small, poorly developed, simple process; ninth sternite and process symmetrical; vestiges of paraprocts present, especially those of the left; vestiges of both cercus-basipodites present in ventral membrane; cerci large, simple, not clavate, equal, nonechinulate.

Females.—Very large (15 to 20 mm. long); uniformly medium brown; antennae brown with several terminal segments white. Occipital foramen acutely pointed apically. Prothorax broad, with a longitudinal pale streak on each anapleurite extending from apophysal pit to anterior dorsal margin. Hind basitarsi elongate, with two prominent sole-bladders.

Genotype.—*Embia nobilis* Gerstaecker, by original designation.¹

Distribution.—RECENT: Northern South America. TERTIARY: Miocene (?), Florissant of Colorado.

Remarks.—Specimens of this easily recognized genus appear to be rare in collections. The numerous occasions on which specimens (mostly immature) have been collected in plant quarantine among orchid roots seem to indicate that this is a favorite habitat of the genus and one to be carefully investigated by field collectors.

In many features, particularly the simple structure of the male abdominal terminalia, *Clothoda* easily ranks as the most generalized group of the order. The species, unlike those of most other genera, do not seem to have constant intraspecific characters; even wing venation is subject to individual variation. There is a great need for studies based upon large numbers of specimens from scattered and single localities, in order to test the constancy of certain characters. The writer provisionally recognizes three Recent species and one subspecies at this time. These may be differentiated as follows:

KEY TO SPECIES OF CLOTHODA (MALES)

1. Tertiary, Florissant of Colorado..... florissantensis
Recent, northern South America..... 2
2. Tenth abdominal tergite entire, without a median cleft or caudal processes;
Brazil..... nobilis
Tenth tergite medially cleft; each hemitergite thus formed bearing a small
but distinct process..... 3
3. Wings with Cu_{1a} usually unbranched; Trinidad..... urichi urichi
Wings with Cu_{1a} 1- or 2-branched; South America..... 4
4. Cu_{1a} with two branches; process of left hemitergite curved mesad at apex;
membranous median cleft of tenth tergite extending to basal margin; second-
ary process of right hemitergite (10 RP_2) attached basally to right hemi-
tergite (10 R); Venezuela..... urichi intermedia
 Cu_{1a} with one branch; 10 LP curved outward at apex; membranous medial cleft
not attaining basal margin; 10 RP_2 free, not attached to 10 R; Colombia
aequicercata

¹Enderlein's concept of this species was based on a specimen from Fonte Boa, Brazil (800 miles from the type locality of *nobilis*), deposited in the Stettin Museum.

CLOTHODA FLORISSANTENSIS (Cockerell)

Embia florissantensis COCKERELL, 1908, p. 231, fig. 4.—HANDLIRSCH, 1906-8, p. 1357.—ENDERLEIN, 1912, p. 53.

Oligotoma florissantensis (Cockerell) KRAUSS, 1911, p. 48.

Clothoda florissantensis (Cockerell) DAVIS, 1939c, p. 379.

Holotype.—Winged male, on rock slab in Riker Mount, University of Colorado Museum.

Type data.—Florissant Colorado Station 14, 1907 (W. P. Cockerell) (Miocene).

Remarks.—This is the only known American fossil embiopteran except *Protambia permiana* Tillyard (1937). Evidence for placing it in the genus *Clothoda* is very inconclusive. In any event, it is probably not an *Embia*, as that genus is confined to Africa and the Mediterranean Region of the Old World.

CLOTHODA NOBILIS (Gerstaecker)

Embia nobilis GERSTAECKER, 1888, p. 1.

Embia (Olyntha) nobilis (Gerstaecker) KRAUSS, 1899, p. 148.

Olyntha nobilis (Gerstaecker) KRAUSS, 1911, p. 31.

Clothoda nobilis (Gerstaecker) ENDERLEIN, 1909, p. 176; 1912, p. 22, figs. 4-6, pl. 1, A-B.*—NAVÁS, 1918, p. 109, fig. 6.—DAVIS, 1939c, p. 373, figs. 1-7.**

Lectotype (?).—Male, McLachlan collection, British Museum of Natural History.

Type data.—"Itaituba (Amazonas)" (Brazil).

Other records.—Fonte Boa (Amazons), Brazil (male and female)*; Amazons, Brazil*; Itaituba, Brazil (male) (McLachlan collection) (BMNH).**

Davis (1939c) has redescribed and figured this species from a topotype specimen in the McLachlan collection that is apparently a Gerstaecker cotype and that perhaps should now be regarded as the lectotype.

CLOTHODA URICHI URICHI (Saussure)

FIGURE 8

Embia urichi SAUSSURE, 1896a, p. 293.

Olyntha urichi (Saussure) KRAUSS, 1911, p. 29, pl. 1, figs. 2, 2A, fig. B (misidentification?).

Antipaluria urichi (Saussure) ENDERLEIN, 1912, p. 64.—NAVÁS, 1918, p. 106.

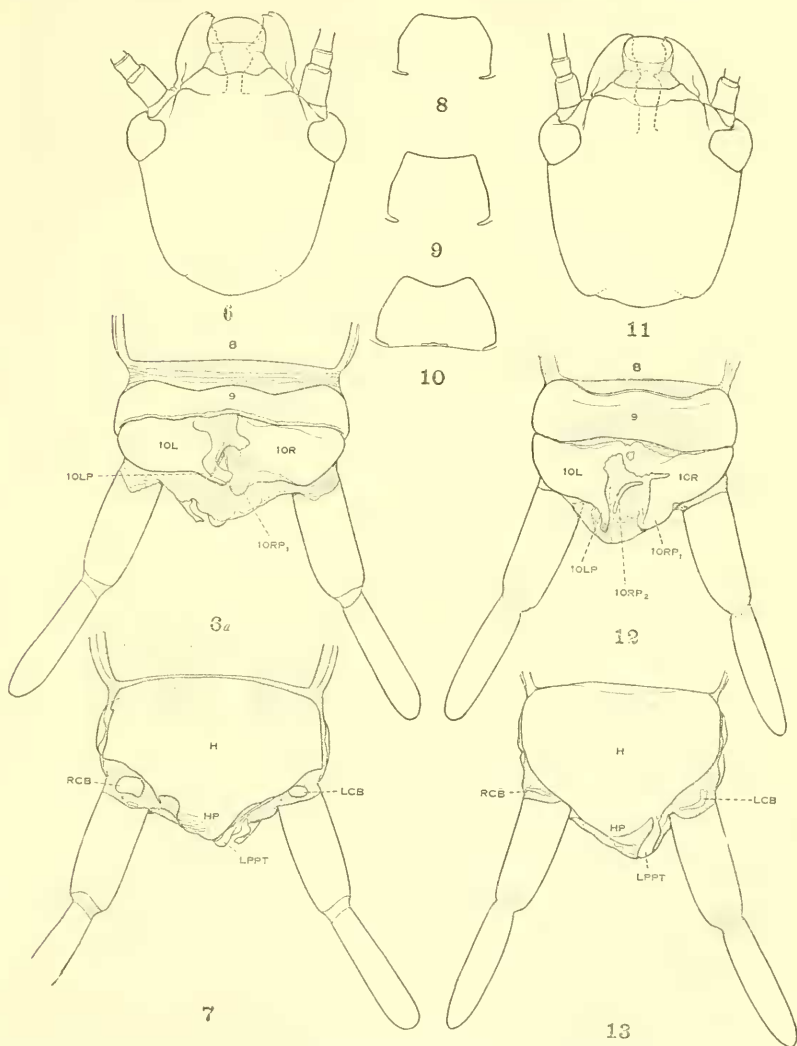
Clothoda urichi (Saussure) DAVIS, 1939c, p. 377, figs. 17-25*; 1942, p. 111, figs. 1-5.**

Embia urichi SAUSSURE (*lapsus calami*), 1896b, p. 350, figs. 1-12.—MELANDER, 1903, p. 103, fig. 2.—FRIEDERICH, 1906, p. 238.—KERSHAW, 1914, p. 24, pls. 3, 4 (embryology).

Cotypes.—Males and females (dried) in Muséum d'Histoire Naturelle, Geneva. The cotype described and figured by Davis (1939c) should have been designated the lectotype.

Type data.—"Insula Trinitaris (Antillae), a Dom. Uricho lecta" (probably at Port of Spain).

Records (all Trinidad).—Port of Spain—1 male (MCZ); 2 females, July 8, 1920 (Wheeler); 1 male (H. Caracicola) (USNM). St. Augustine—1 male, March 13, 1941, "on grapefruit trunk" (E. McC.



FIGURES 6, 7, 9.—*Clothoda urichi intermedia* Davis, plesiotype male (Venezuela): 6, Head; 6a, terminalia (dorsal); 7, terminalia (ventral); 9, outline of submentum.

FIGURE 8.—*Clothoda urichi urichi* (Saussure), male (Trinidad): Outline of submentum.

FIGURES 10-13.—*Clothoda aequicercata* (Enderlein), plesiotype male (Colombia): 10, Outline of submentum; 11, head; 12, terminalia (dorsal); 13, terminalia (ventral). Explanation of symbols on p. 403.

Callan) (EMcC); 1 male, March 18, 1938*; 2 males, 20 immature, January 6, 1939.** Gaspar Grande—3 moles, 1 female, December 13, 1936 (A. M. Adamson) (EMcC) (1 male retained in writer's collection). Mount St. Benedict—2 males, 15 immature, January 23, 1938 (E. McC. Callan).** La Laja—1 male, 8 females, 11 immature, April 24, 1938 (E. McC. Callan).**

Remarks.—Krauss (1911) recorded this species from Colombia. This appears to be based upon a misidentified specimen of *aequicercata*. This very same specimen may have indeed later become the holotype of *aequicercata*, as the data and disposition records are identical in both cases. The wing figured by him (*l. c.*, fig. 2), however, appears to be that of a specimen of *Pararhagadochir*.

C. u. urichi, like *nobilis*, has been adequately treated by Davis, who had the opportunity to redescribe one of Saussure's cotypes. The abdominal terminalia of the male are almost identical to those of the Venezuelan subspecies *intermedia* Davis (*vid. infra*), but *urichi* can be separated by its lighter color, smaller size, usually unbranched Cu_{1a} wing vein, the shape of the submentum (figs. 8 vs. 9), and its insular distribution. Two female specimens at hand can be separated from the mainland *Clothoda* females by the light, golden-brown color and the visible dorsal head pattern.

CLOTHODA URICHI INTERMEDIA Davis

PLATE 18, A; FIGURES 6, 6a, 7, 9

Clothoda intermedia DAVIS, 1939c, p. 376, figs. 8-16; 1942, p. 112 (as a synonym of *urichi*).

Holotype.—Male (dried) (damaged in transit after description was made), British Museum of Natural History.

Type data.—Caracas, Venezuela (Dr. Ernst).

Neallotype (by present designation).—Female, on slide, deposited in United States National Museum, from El Valle, Venezuela, June 11, 1938, collected on *Ceiba pentandra* (C. H. Ballou).

Plesiotype (by present designation).—Male, on slide, with same data as neallotype female (from same vial), deposited in United States National Museum.

Other records.—One male (terminalia missing), Caracas, Venezuela, July 10, 1938 (C. H. Ballou) (USNM) (retained in writer's collection); six females, Los Teques, Venezuela, September 23, 1938, "on clay bank" (C. H. Ballou) (USNM) (two retained in writer's collection).

Plesiotype male.—Color (on slide) uniform reddish brown, terminal antennal segments cream-colored. Length 17 mm.; forewing length 10.5 mm., breadth 2.5 mm.

Head (fig. 6) medium sized; with sides behind eyes rather straight, gradually convergent, caudal angles evenly rounded, caudal margin arcuate, not deeply emarginated at postoccipital sutures. Antennae with 22 segments present (incomplete). Mandibles dark reddish brown, grinding surfaces nearly black; left mandible with 3 apical dentations and a large medial tooth on grinding surface; right mandible with 2 broad apical teeth and without a medial tooth. Submentum (fig. 9) about as long as broad; sides gradually convergent, slightly biemarginate. Ventral bridge as long as submentum. Occipital foramen acute apically, longer than broad.

Wings (pl. 18, A) relatively long and narrow, venation and cross veins as figured; Cu_{1a} in both wings with two branches, the second branch represented by only a hyaline interveinal line and a row of sparse setae in hindwing.

Terminalia (figs. 6a and 7) relatively larger and broader than those of *aequicercata*. Ninth tergite (9) seven times longer than broad, with basal margin broadly biemarginate, not so elongate at median arcuation as at sides; apical margin narrowly membranous throughout most of its width. Tenth tergite rather narrowly cleft to basal margin, cleft broadly membranous basally; left hemitergite (10 L) rectangular, transverse; process (10 LP) distinct, directed mesocaudad at a 20° angle, sclerotized along outer (left) margin, fleshy along inner margin; right hemitergite (10 R) larger and broader than 10 L; process (10 RP_1) an irregular, caudally membranous lobe; inwardly slanting secondary process (10 RP_2) very narrow, sclerotic, connected basally with base of 10 RP_1 . Ninth sternite (H) strongly transverse, basal margin interrupted by two lightly pigmented areas; process (HP) relatively well developed, irregular in outline. Right paraproct obsolete. Left paraproct (LPPT) distinct, extending from base of left cercus to beyond apex of HP, narrow, irregular, lying close to HP throughout its length, expanded apically. An isolated, twisted, small sclerite of undetermined homology projects caudad between LPPT and base of left cercus. Left and right cercus-basipodites (LCB, RCB) represented by small, circular, setose sclerites in ventral membrane. Left and right cerci subequal.

Neallotype female.—Color (on slide): Head dark chocolate brown, thoracic and abdominal segments progressively lighter brown caudad, terminal segments pale tan; legs uniform light brown, except hindtibiae and tarsi, which are pale tan. Length 18.5 mm. Head with occipital foramen acutely pointed anteriorly; ventral bridge very pale medially; dorsal pattern obsolete.

Remarks.—Davis (1942) has placed his *intermedia* in synonymy with *urichi*, but the writer prefers to regard *intermedia* as a mainland subspecies of *urichi*, as the Venezuelan specimens studied are larger

and darker and have minor structural differences in head form, shape of the submentum, etc., and Cu_{1a} two-branched. The writer has seen specimens from Trinidad that indeed possess some or all of the characters of the mainland series, but this is regarded as a normal phenomenon associated with certain subspecies populations. It is likely that large series from each area will exhibit a preponderance of one or the other combination of characters with a certain percentage of discrepant individuals, which can be assigned to their proper subspecies only upon distributional data.

CLOTHODA AEQUICERCATA (Enderlein)

FIGURES 10-13

Antipaluria aequicercata ENDERLEIN, 1912, p. 63.—NAVÁS, 1918, p. 107.

Clothoda aequicercata (Enderlein) DAVIS, 1939c, p. 379.

This species, known heretofore by only the unique male holotype from Colombia with damaged terminalia, is here redescribed from a perfect male from the same country which fits Enderlein's original description so well that it is believed to be conspecific with the holotype of *aequicercata*.

Plesiotype male.—Color (on slide) uniform dark chocolate brown; head, prothorax, and forelegs somewhat darker; five terminal antennal segments cream-colored. Length 16.5 mm.; forewing length 10 mm., breadth 2.5 mm.

Head (fig. 11) large, quadrate, nearly as broad at caudal angles as behind eyes; sides scarcely convergent, very slightly arcuate; caudal margin truncate, deeply emarginated on each side at postoccipital sutures, region between broadly arcuate. Antennae 23-segmented (apparently complete). Mandibles stout, similar to those of *intermedia* but strongly curved downward apically. Submentum (fig. 10) much broader than long; sides strongly convergent, somewhat arcuate. Ventral bridge extensive, one-half longer than length of submentum. Occipital foramen rounded apically; as broad as long.

Wings relatively short and broad, venation and cross veins similar to *intermedia* (pl. 18, A); Cu_{1a} in both wings with but one branch.

Terminalia (figs. 12, 13) relatively small. Ninth tergite (9) elongate, only four times as broad as median length; basal margin biemarginate; as elongate at median arcuation as at sides; apical region extensively membranous medially. Tenth tergite broadly cleft, but not entirely to base; left hemitergite (10 L) triangulate; process (10 LP) distinct, inwardly directed caudad at 45°, curving straight back and outward at apex; right hemitergite (10 R) more transverse than 10 L; process (10 RP_1) indefinite, lobelike; inwardly slanting, narrow, sclerotic process (10 RP_2) (connected to 10 RP in *intermedia*) isolated in membrane. Ninth sternite (H) broad basally,

gradually convergent from sides at basal half; process (HP) not developed. Right paraproct obsolete. Left paraproct (LPPT) narrowly fused to H basally, broadened and spatuliform apically. Left and right cercus-basipodites (LCB, RCB) represented by small, narrow, ventral, setose, sclerotic areas. Left and right cerci subequal.

Female.—No specimens definitely associated with male.

Holotype.—Male (terminalia damaged), in Berliner Zoologischen Museum (No. 2734).

Type data.—Colombia (Moritz collection).

Plesiotype (described above).—Male, on slide, in United States National Museum, collected May 3, 1939, in plant quarantine at Washington, D. C., in wild orchids shipped from Medellín, Colombia.

Remarks.—It is difficult to understand why Enderlein placed this species, as well as *urichi*, apart from *Clothoda* into his genus *Antipaluria*; *aequicercata* is closely related to *urichi* and *intermedia* but may be separated from both by its much darker color, the broad, parallel-sided head, the transverse submentum, the forked Cu_{1a} vein (usually simple in *urichi*, usually 2-forked in *intermedia* and *nobilis*), and the fact that the cleft of the tenth tergite does not attain the base.

A curious venational aberration is present on the left hindwing of the plesiotype. The media unites with the anterior branch of Cu_{1a} , and both veins continue to the terminus as a single vein. The hyaline stripe between the veins is abruptly terminated at the point of union of the two.

A female *Clothoda* at hand from Colombia, which appears to be *aequicercata*, is easily distinguishable from those of *urichi* and *intermedia* by its very dark color. The head, prothorax, and forelegs (including tarsi) are blackish brown.

Family EMBIIDAE

[Complete list of references not given.]

Embiidae BURMEISTER, 1839, p. 763.

Embiidae ENDERLEIN, 1909, p. 176.

Olynthidae KRAUSS, 1911, p. 27.

Old and New World Embioptera: Males with dentate mandibles—three apical dentations on the right, two on the left. When winged, R_{4+5} forked in both wings (except forewing of *Calamoclostes albistriolatus*). Tenth abdominal tergite medially cleft to basal margin, each hemitergite bearing caudal processes; the left process usually narrow, sclerotic, and more definite than the right process, which is generally broad and not sharply defined. Composite left paraproct and left cercus-basipodite well represented. Left cercus with basal segment always echinulate on inner side and sometimes strongly lobed. Hind basitarsus with either one or two sole-bladders.

Type genus.—*Embia* Latreille.

Distribution.—Circum-Mediterranean, African, Indian, South American, and Central American regions.

KEY TO GENERA OF AMERICAN EMBIIDAE (MALES)

1. Process of left hemitergite complex, bifid; usually bearing both a sclerotic, talonlike, inner process and a submembranous, broader, irregular, outer lobe..... Pararhagadochir
- Process of left hemitergite simple, represented by only a slender, usually outwardly curving process..... 2
2. Size small (about 5 mm. long); left cercus without a definite, swollen inner nodule; terminal segment of labial palpus, conical, acutely pointed
Microembia
- Size moderate to large (at least 9 mm. long); left cercus with a definite, usually subapical, inner nodule; terminal segment of labial palpus globular, rounded apically..... 3
3. Basal segment of left cercus with echinulate nodule located at base
Neorhagadochir
- Basal segment of left cercus with echinulate nodule located medially or terminally on inner side..... 4
4. Right hemitergite small, not developed caudally as a process, but as a fleshy lobe..... Calamoclostes
- Right hemitergite well developed, caudal angle pointed, sclerotized
Embolynta

Genus EMBOLYNTHA Davis

Embolynta DAVIS, 1940b, p. 344.

Embius GRAY, 1832, p. 786, pl. 72, fig. 2 (name preoccupied).

Olynta GRAY, 1832, p. 347 (name preoccupied in Lepidoptera, *i. e.*, *Olyntus* Hübner, 1818).

Genotype.—*Olynta brasiliensis* Gray, by original designation.

Distribution.—South America.

This genus has been very well treated by Davis, who had the good fortune of being able to examine, redescribe, and figure the holotypes of each of the four species² he included in the genus. However, a question arises concerning the possibility that some, or all, of these species are congeneric with *Calamoclostes albistriolatus* Enderlein. The writer has examined the two specimens from Barro Alto, Brazil (MCZ), which were identified as *batesi* by Davis. These are unquestionably congeneric with a new species from Colombia, which the writer prefers to assign to the genus *Calamoclostes* because the structure of its terminalia seems to be very similar to *albistriolatus*. The peculiar wing venation (possibly anomalous) of the latter species and its slightly more complex left tergal process are not regarded here as characters of generic importance. However, the writer is not placing the genus *Embolynta* as a synonym of *Calamoclostes* at this time, as he has not studied the genotypes.

² One of these, *salvini*, is now removed to the new genus *Neorhagadochir*.

KEY TO SPECIES OF EMBOLYNTHA (MALES)³

1. Posterior process of right hemitergite slender, directed outward; internal echinulate lobe of first segment of left cercus subterminal----- 2
Posterior process of right hemitergite short and thick, directed inward; internal lobe of first segment of left cercus medial (subterminal in nontypical variations)----- batesi
2. Process of left hemitergite bearing two small hooks; internal lobe of basal segment of left cercus longer than thick----- brasiliensis
Process of left hemitergite not as above; internal lobe of basal segment of left cercus broader than long----- wagneri

EMBOLYNTHA BRASILIENSIS (Gray)

Emblius (?) *brasiliensis* GRAY, 1832, p. 786, pl. 72, fig. 2.

Olyntha brasiliensis (Gray) GRAY, 1832, p. 347.—WESTWOOD, 1837, p. 373, pl. 2, fig. 3.—BURMEISTER, 1839, p. 770.—WALKER, 1853, p. 532.—KRAUSS, 1911, p. 28, pl. 1, fig. 1.

Embia (*Olyntha*) *brasiliensis* (Gray) HAGEN, 1885, p. 195.

Embia brasiliensis (Gray) ENDERLEIN, 1912, p. 48, fig. 24.—NAVÁS, 1918, p. 98.

Embolynta brasiliensis (Gray) DAVIS, 1940b, p. 345, figs. 1-7 (redescribes and figures holotype).

Embia brasiliensis var. *flavicercatus* ENDERLEIN, 1912, p. 49.

Holotype.—Male, Children collection, British Museum of Natural History (redescribed by Davis).

Type data.—"Brazil."

Remarks.—Enderlein's "variety" *flavicercata*, based upon a specimen determined as *brasiliensis* by Burmeister and apparently not actually seen by Enderlein, will require reexamination before the name can be accepted.

EMBOLYNTHA BATESI (McLachlan)

Embia batesi McLACHLAN, 1877, p. 380.—NAVÁS, 1918, p. 99.

Embia (*Olyntha*) *batesi* McLACHLAN, HAGEN, 1885, p. 195.

Olyntha batesi (McLachlan) KRAUSS, 1911, p. 29.

Rhagadochir batesi (McLachlan) ENDERLEIN, 1912, p. 56.

Embolynta batesi (McLachlan) DAVIS, 1940b, p. 347, figs. 8-27 (redescribes and figures holotype).*

Type data.—"Amazons," Brazil (Bates).

Other records.—Espírito Santo, Brazil (McLachlan collection), males*; Barro Alto, Est. Minas. Brazil (MCZ), 2 males.*

EMBOLYNTHA WAGNERI (Navás)

Embia wagneri NAVÁS, 1924a, p. 13, fig. 3.

Embolynta wagneri (Navás) DAVIS, 1940b, p. 351, figs. 38-41 (redescribes and figures holotype).

Holotype.—Male, Paris Museum (redescribed by Davis).

Type data.—Argentina: "Chaco de Santiago del Estero. Bords du Río Salado. La Palisa de Bracho. 25 kil. N. O. [N. W.] d'Icaño. E. R. Wagner, Décembre 1905."

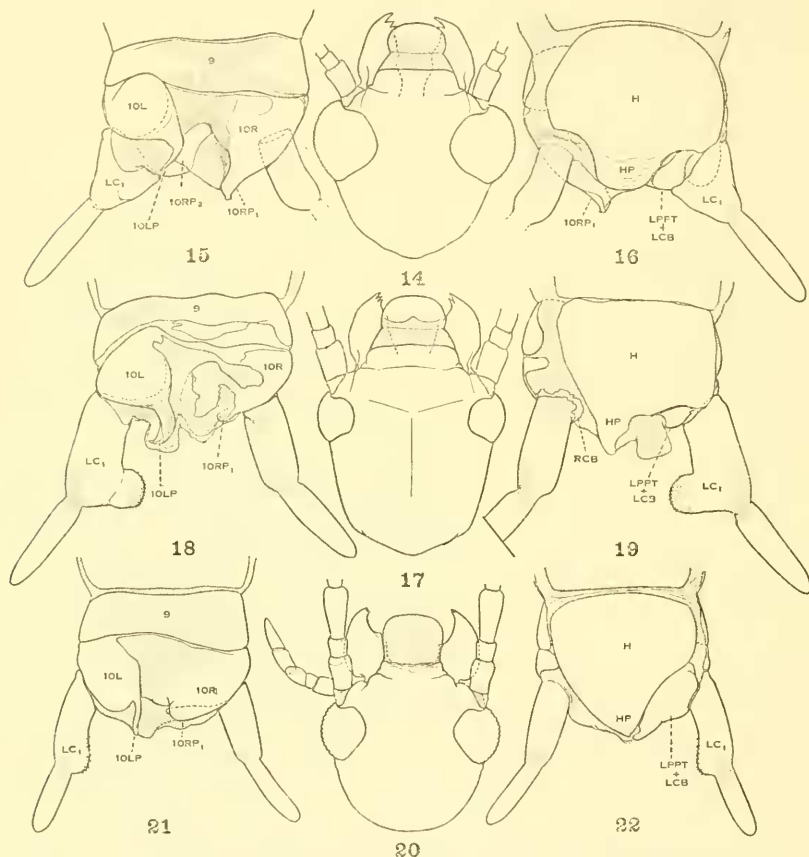
³ After Davis, 1940b, p. 351.

Genus CALAMOCLOSTES Enderlein

Calamoclostes ENDERLEIN, 1909, p. 188.—KRAUSS, 1911, p. 73.—ENDERLEIN, 1912, p. 27.—NAVÁS, 1918, p. 94.—DAVIS, 1940a, p. 189.

Genotype—*Calamoclostes albistriolatus* Enderlein, by original designation.

Distribution—Ecuador, Colombia.



FIGURES 14-16.—*Neorhagadochir inflata*, new genus and species, holotype male (Guatemala): 14, Head; 15, terminalia (dorsal); 16, terminalia (ventral).

FIGURES 17-19.—*Calamoclostes gurneyi*, new species, holotype male (Colombia): 17, Head; 18, terminalia (dorsal); 19, terminalia (ventral).

FIGURES 20-22.—*Microemia rugosifrons*, new genus and species, holotype male (Peru): 20, Head; 21, terminalia (dorsal); 22, terminalia (ventral). Explanation of symbols on p. 403.

This genus was originally based upon a single male specimen from Ecuador with R_{4+5} simple in the forewing and terminally forked in the hindwing. The writer is now adding a second species, which,

though possessing typical embioid wing venation (i. e., R_{4+5} forked in both wings), has abdominal terminalia apparently very similar to *albistriolatus* (as near as can be judged by reference to Enderlein's incomplete figure (1912, fig. 11)). The peculiar wing venation of Enderlein's specimen may prove to be anomalous, and thus the genus should be defined on the basis of structure of terminalia. The genus appears to be allied to *Embolyntha* but apparently can be separated from it by the weakly developed, fleshy right hemitergite.

It is noteworthy that the two included species occur in the same region, i. e., along adjacent upper tributaries of the Amazon River. *C. albistriolatus* apparently can be distinguished from *C. gurneyi* by the white cross veins of the wings and the basal tooth on the outer margin of the left tergal process (10 LP).

CALAMOCLOSTES ALBISTRIOLOSTES Enderlein

Calamoclostes albistriolatus ENDERLEIN, 1909, p. 189.—KRAUSS, 1911, p. 73.—ENDERLEIN, 1912, p. 28, figs. 10-11, pl. 3, fig. M.—NAVÁS, 1918, p. 94.—DAVIS, 1940a, p. 189, figs. 82-83 (after Enderlein).

Holotype.—Male, in Stettiner Zoologischen Museum.

Type data.—"Ecuador. Baños am Ostabhange der Ostkette der Cordilliere, 1800 m. hoch. 31, März 1899. 1 ♂, gesammelt von E. Schmidt (coll. Haensch)."

CALAMOCLOSTES GURNEYI, new species

FIGURES 17-19

Male.—Color (on slide) very uniform dark chocolate brown throughout, head slightly darker. Length 16 mm.; forewing length 9.5 mm., breadth 2.3 mm.

Head (fig. 17) relatively small; eyes moderate sized, inflated, separated by an interspace three times their width; sides behind eyes two and one-half eye lengths long, nearly straight, gradually convergent; caudal angles abrupt, margin obtusely rounded. Mandibles very broad, thick; apical dentations prominent, sharply pointed. Mentum well developed, broadly triangulate. Submentum sclerotized, quadrate, broader than long. Occipital foramen elongated, acutely pointed apically. Ventral bridge slightly shorter than length of submentum. Antennae with segments very broad, stout.

Wings large, with rather few cross veins; venation embioid, with all veins well defined nearly to terminus. Hyaline lines narrow, definite.

Hind basitarsi elongate, with only one sole-bladder.

Terminalia (figs. 18, 19) with ninth tergite strongly asymmetrical, interrupted by membranous areas, possessing a medial, darkly pigmented area on caudal margin in an upright position. Tenth tergite

greatly broken up by an extensive medial cleft, short, strongly asymmetrical; left hemitergite (10 L) large, dark, well defined, convex, its process (10 LP) large, stout, directed inward at 45° at basal half, thence caudad, the extreme tip truncate and bearing a small, sharp point on outer angle directed laterad; right hemitergite (10 R) small, irregular, caudal angle a membranous lobe, inner margin produced inward and expanded as a broad pigmented sclerite (10 RP₂). Ninth sternite (H) very large, quadrate; developed toward right side as a weak, terminally membranous process (HP). Left paraproct probably represented by a fleshy lobe (LPPT?) subtending 10 LP, setose. Left cercus-basipodite probably represented by a very dark, sclerotic sclerite (LCB?) fused basally to H. Right cercus-basipodite (RCB) a nearly complete ventral, ragged ring at base of right cercus. Left cercus with basal segment LC₁ very large, broad, cylindrical basally, but apically abruptly produced inward as a large echinulate nodule; outer apical angle membranous. Terminal segment narrow, gradually acuminate distad. Basal segment of right cercus stout, cylindrical, submembranous dorsally; terminal segment similar to that of LC, but stouter.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56041.

Type data.—Upper Putumayo River, Colombia (B. Guevara) (USNM).

Remarks.—The large size and uniform brown color give this species the general appearance of a *Clothoda*. It is named for Dr. A. B. Gurney, of the United States Bureau of Entomology and Plant Quarantine.

MICROEMBIA, new genus

Males.—Small, 4.5 to 5 mm. long. Head with eyes large, facets very prominent; clypeal margin heavily sclerotized, rugose, lateral angles produced. Antennae relatively large. Mandibles very large, broad outer margins strongly arcuate; apices microdentate, three dentations on the left and two on the right mandible. Terminal segment of labial palpus strongly tapered and pointed. Prothorax small. Legs long, slender; hind basitarsi elongate, ventral setae long, with only a very small terminal sole-bladder. Wings relatively large; R₁ narrow, terminating abruptly before apical margin; R₂₊₃ simple; R₄₊₅ forked before middle; M and Cu_{1a} simple; R₄₊₅, M and Cu_{1a} represented only by rows of setae and pigment bands; two cross-veins present between apex of R₁ and R₂₊₃ of forewing; hyaline bands broad, bordered by definite rows of macrotrichiae. Terminalia small, pale; tenth tergite entirely cleft to basal margin forming a broad, membranous basal area; left hemitergite bearing a narrow, simple process projecting straight back from inner margin; right hemiter-

gite rounded caudally, without definite processes. Process of ninth sternite simple. Composite left paraproct and left cercus-basipodite well represented, large, simple. Left cercus not strongly clavate, bearing a few large echinulations subapically on inner side; terminal segment rather short, broad basally, distally acuminate. Right cercus with terminal segment narrower than that of left cercus. Both cerci with sensory setae well developed, "rosette" sockets prominent.

Female.—Unknown.

Genotype.—*Microembia rugosifrons*, new species.

Distribution.—Peru.

MICROEMBIA RUGOSIFRONS, new species

FIGURES 20-22

Male.—Color (on slide): Body, legs, and wings light tan; head medium brown, mandibles yellowish. Length 4.5 mm.; forewing length 3.5 mm., breadth 0.9 mm.

Head (fig. 20) short, circular—as broad across eyes as long, dorso-ventral thickness unusually great; eye interspace two eye widths wide; sides behind eyes short—one eye length long, gradually rounded behind; caudal margin evenly arcuate; surface clothed with long sparse setae; dorsal and ventral margins of antennal foramen extensive; mentum a very small sclerite; submentum dark, broad anteriorly, gradually narrowed basally, anterior margin transverse, mandibles broad with apical teeth scarcely separated, greatly expanded before base, base abruptly narrowed; occipital foramen rounded anteriorly.

Terminalia (figs. 21, 22) with left hemitergite (10 L) large, dark, inner margin straight, continued caudad to form inner margin of straight process (10 LP), which is narrow, simple, slightly dilated terminally; right hemitergite (10 R) short, caudal margin rounded without a developed process but folded down and inward. Ninth sternite (H) broad, quadrate, clothed with sparse, long setae, gradually tapered caudad to form a short, pointed process (HP). Composite left paraproct and left cercus-basipodite (LPPT+LCB) large, elongate, rhomboid. Basal segment of left cercus (LC₁) only slightly clavate terminally; echinulations large, sparse, bifid. Terminal segment broadly attached basally, short, broad. Terminal segment of right cercus normally attached basally, narrower and slightly longer than that of LC₂.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56043.

Type data.—Iquitos, Peru, March-April 1931 (R. C. Shannon) (USNM).

Paratype.—Male, on slide with type data, deposited in writer's collection.

Remarks.—Two other specimens at hand are in such poor condition that they cannot be designated paratypes. The above series was probably collected at light.

NEORHAGADOCHIR, new genus

Males.—Moderate sized (7.5–10.5 mm. long). Head with eyes medium to large sized, inflated; mandibles dentate, three apical teeth on the left and two on the right mandible; submentum very large, sclerotic, similar to that of *Pararhagadochir*; mentum represented by setae only. Wings embioid, without apparent generic characters. Terminalia with tenth tergite completely, broadly cleft to base; left tergal process simple, talonlike; right tergal process poorly defined, similar to that of *Pararhagadochir* as is also the diagonal median process (10 RP₂). Hypandrium process (HP) symmetrical, broad, truncate, simple. Composite left paraproct and left cercus-basipodite well developed. Basal segment of left cercus short, conical; basal foramen very broad, margin sclerotic; gradually, inwardly produced at base as an echinulate nodule; terminal portion cylindrical, unclavate. Terminal segment of left cercus elongate, longer than basal segment.

Female.—Unknown.

Genotype.—*Neorhagadochir inflata*, new species.

Distribution.—Central America.

Remarks.—This genus is primarily proposed for *inflata*, new species, which apparently cannot be assigned to any existing genus; *salvini* is tentatively included because of the nature of its left cercus and the conformity of certain other characters with *inflata*. *Neorhagadochir* appears to have more characters in common with *Pararhagadochir* than *Embolynta*, i. e., the characters of the head, particularly the mandibles and labium and the median tenth tergal process (10 RP₂). It can be separated from *Pararhagadochir* by the simplicity of the left tergal process and from *Embolynta* by the basal position of the echinulate nodule of the left cercus.

The two included species may be separated as follows:

KEY TO SPECIES OF NEORHAGADOCHIR (MALES)

1. Process of left hemitergite greatly elongated — longer than basal segment of left cercus; composite left paraproct and left cercus-basipodite (LPPT+LCB) terminally echinulate; head with eyes relatively small, one-fourth as long as sides of head, which are only slightly convergent.....*salvini*
 Process of left hemitergite short—shorter than basal segment of left cercus; LPPT+LCB not echinulate; head with eyes very large, as long as sides of head which are strongly convergent.....*inflata*

NEORHAGADOCHIR INFLATA, new species

FIGURES 14-16

Male.—Color (on slide) uniform, light golden brown; head considerably darker. Length 7.5 mm.; forewing length 5 mm., breadth 1.2 mm.

Head (fig. 14) very broad across eyes, short; eyes very large, strongly inflated, facets large; sides behind eyes short, strongly convergent; caudal margin obtusely rounded. Mandibles thin, with apical dentations large, sharp. Submentum sclerotic, large, elongate; sides evenly arcuate; apical margin evenly emarginated. Occipital foramen with apical angle acute.

Wings with R_1 closely paralleling costa almost to terminus, then curving toward R_{2+3} . R_{2+3} forked at basal third of wing and R_{4+5} just within its basal half in both wings. Cross veins not prominent. Hyaline stripes rather narrow, sharply defined.

Hind basitarsi short; plantar setae sparse, stout; only one bladder.

Terminalia (figs. 15, 16) small, transverse; tenth tergite broadly cleft to base. Left hemitergite (10 L) small, convex; gradually tapered on inner apical angle to form a process (10 LP) that abruptly curves outward nearly at 90° , and becomes a very narrow, simple, tapered, sharp point as long as its base and heavily sclerotic. Right hemitergite (10 R) broad, tapered at caudal angle to form a small, truncate process (10 RP_1) which is narrowest at base. Ninth sternite (H) transverse; caudal and lateral margins arcuate, symmetrically produced medially as a short, truncate process (HP). Composite left paraproct and left cercus-basipodite, (LPPT+LCB) triangular. Right paraproct (RPPT) rudimentary, fused to side of HP. Basal segment of left cercus (LC_1) very short, funnel-shaped; basal foramen very large, margin sclerotic; gradually produced inwardly at extreme base as a conical, microechinulate nodule. Terminal segment elongate, nearly twice as long as LC_1 . Basal segment of right cercus (RC_1) very short, membranous at outer half, membrane at base with a distinct ring (probably the right cercus-basipodite (RCB)); terminal segment lost, but probably similar to LC_2 .

Female.—Unknown.

Holotype.—Winged male, on slide, U.S.N.M. No. 56042.

Type data.—Cayuga, Guatemala, May 1915 (Wm. Schaus).

NEORHAGADOCHIR SALVINI (McLachlan), new combination

Embia salvini McLACHLAN, 1877, p. 380.—ENDERLEIN, 1912, p. 51.

Embia (Olyntha) salvini McLachlan, HAGEN, 1885, p. 198.*

Olyntha salvini (McLachlan) KRAUSS, 1911, p. 31.

Embotyntha salvini (McLachlan) DAVIS, 1940b, p. 349, figs. 32-37 (redescribes and figures holotype).

Embia salomi ENDERLEIN, 1912, p. 30 (footnote, *lapsus calami* for *salvini*, corrected p. 116).

Holotype.—Male, McLachlan collection, British Museum of Natural History.

Type data.—Chinuatta, [Guatemala], at 4,100 feet. (Salvin).

Other record.—Isthmus of Tehuantepec, Mexico (Sumichrast) (MCZ).* The writer has recently confirmed this identification.

Genus PARARHAGADOCHIR Davis

Pararhagadochir DAVIS, 1940a, p. 181; 1942, p. 114.

Males.—Alate, medium sized (length 6–13 mm.); color usually dark brown, prothorax often pale yellow. Head with eyes medium to large; mandibles thin, with sharp inner apical dentations; submentum large, sclerotic, shieldlike. Wings dark; venation strong, R_{4+5} forked in both wings; R_1 prominent, often with broad reddish bordering bands; hyaline stripes narrow, sharply defined. Hind basitarsus with one or two sole-bladders. Terminalia with tenth tergite broadly cleft to base; left hemitergite small, its process complex, bifid, inner portion usually slender, talonlike, sclerotic, outer portion broad, thin, submembranous; right hemitergite large, tapered terminally to form an indefinite process often with a small, abrupt, narrow, sclerotic, apical appendix; inner margin produced mesad with a narrow, elongate sclerite (10 RP_2) extending caudad toward left in membrane of median cleft. Process of hypandrium short, blunt. Composite left paraproct and left cercus-basipodite broad, fused basally to ninth sternite. Basal segment of left cercus with a very large, inner, subterminal nodule, which is densely microechinulate. Terminal segments of both cerci and basal segment of right cercus narrow, elongate; basal segment of right cercus membranous except along inner margin.

Females.—Moderate sized; darkly pigmented integument sometimes metallic blue in luster. Hind basitarsi densely setose ventrally; apparently always with two sole-bladders (even in species with males possessing but one bladder), the additional bladder at times small, indistinct. Basal segments of cerci short—one-third shorter than terminal segments; outer half membranous with a partially complete basal ring.

Genotype.—*Embia trinitatis* Saussure, by original designation.

Distribution.—Northern South America and Trinidad to Argentina.

Remarks.—This distinct genus probably comprises a much larger number of species than at present described. Several difficult problems involving the definition of its species remain to be solved and more material may reveal the existence of several subspecies complexes.

The problem of the relationship of this genus to the African genus *Rhagadochir* Enderlein must be carefully investigated. The charac-

ters of *Rhagadochir carpenteri* Davis are certainly similar to those of the American series placed by Davis in his genus *Pararhagadochir*, but future studies may prove this similarity to be a result of convergence.

The number of hind basitarsal sole-bladders appears to be a constant character within a species, genus, or even family throughout the order. The genus *Pararhagadochir* is an exception to this rule, as the females of the genus seem always to have two bladders, while males of the same species may have only one. There is indeed a possibility that in males of some species this character may be subject to intraspecific variation.

KEY TO SPECIES OF PARARHAGADOCHIR (MALES)

1. Inner nodule of basal segment of left cercus conical; right hemitergite with caudal margin rounded, not acutely produced; Bolivia-----*adspersa*
Inner nodule of left cercus broadly rounded or truncate apically; right hemitergite with an acute caudal angle terminated by a narrow sclerotic spine----- 2
2. Prothorax and pterothorax unicolorous; composite left paraproct (LPPT+LCB) with a small, domelike, echinulate nodule near posterior margin or with surface of inner apical angle at least echinulate----- 6
Prothorax usually distinctly paler than pterothorax (except in *surinamensis*); LPPT+LCB without such a nodule or echinulations----- 3
3. LPPT+LCB with a sharp, sclerotic projection at inner apical angle; left tergal process (10 LP) with outer portion acutely pointed, or irregular, apex may be turned forward; northern South America-----*trinitatis* complex
LPPT+LCB with only a blunt projection, or none, at inner apical angle; 10 LP with outer portion narrowly or broadly rounded distad----- 4
4. 10 LP with outer portion broadly rounded, broader than long (fig. 60); thorax concolorous; Surinam-----*surinamensis*
10 LP with outer portion narrowly rounded, longer than broad; thorax usually bicolorous----- 5
5. 10 LP greatly elongated, about four times longer than broad; cleft originating at apical fourth (fig. 37); Argentina-----*trachelia*
10 LP much less elongated, less than three times longer than broad; cleft originating just distad of apical half (fig. 51); Paraguay-----*schadei*
6. LPPT+LCB without a distinct echinulate nodule; Brazil-----*davisi*
LPPT+LCB with a distinct echinulate nodule at caudal margin----- 7
7. 10 LP with outer portion narrow, fingerlike, outline even (fig. 49); Paraguay-----*confusa*
10 LP with outer portion broad, at least basally, irregular in outline----- 8
8. 10 LP with inner talonlike portion gradually, evenly curved outward (fig. 45); Bolivia-----*tenuis*
10 LP with inner talon abruptly curved outward, almost at 90° (fig. 41); Argentina-----*birabeni*

PARARHAGADOCHIR TRINITATIS TRINITATIS (Saussure)

FIGURES 26, 29

Embia trinitatis SAUSSURE, 1896a, p. 293; 1896b, p. 352, fig. 13.—ENDERLEIN, 1912, pp. 52, 106 (misspelled as *trinitatensis* p. 30).—NAVÁS, 1918, p. 99.

Oligotoma trinitatis (Saussure) KRAUSS, 1911, p. 42, pl. 2, figs. 11, 11a.

Pararhagadochir trinitatis (Saussure) DAVIS, 1940a, p. 182, figs. 42-48*; 1942, p. 114, figs. 6-10.**

Oligotoma flavicollis KRAUSS, 1911, p. 43, pl. 2, fig. 12 (Orinoco, Venezuela; Berlin Mus.).—ENDERLEIN, 1912, p. 100 (as a synonym of *flavicollis* Enderlein).

Cotype.—Male, Geneva Museum (redescribed and figured by Davis, 1940a), from Trinidad (Urich), probably Port of Spain.

Specimens examined (from Trinidad).—St. Augustine—1 male, July 9, 1935 (P. C. Atteck) (EMcC); many males and females, on grapefruit trunk, March 13, 15, 1941 (E. McC. Callan) (EMcC). Arouca—1 male, May 24, 1939 (E. McC. Callan) (EMcC).

Other records.—St. Augustine, Trinidad, 1 male, May 10, 1935 (N. A. Weber) (MCZ)*; St. Augustine, Trinidad, males, females, and immatures, January 17, 1938, March 25, 1938, and February 19, 1939 (E. McC. Callan).**

Remarks.—The characters of this species have been well treated by Davis (1940a, 1942), and the writer is presenting figures only of the head and left tergal process at this time.

The Venezuela specimen upon which Krauss based his *flavicollis* appears to be very similar to one before the writer, which may prove to represent a distinct subspecies. Should such a subspecies be described, Krauss's specimen would become its type, with a new name proposed to replace *flavicollis* Krauss, which is a secondary homonym.

In addition to the above recorded Trinidad specimens, the writer has before him several specimens from mainland localities which are distinct in several features, particularly in the form of the left tergal process and head. Should such features appear constant in series, in relation to geographic distribution, the specimens may be regarded as subspecies of *trinitatis*. For the present they are discussed below with accompanying figures, but not named.

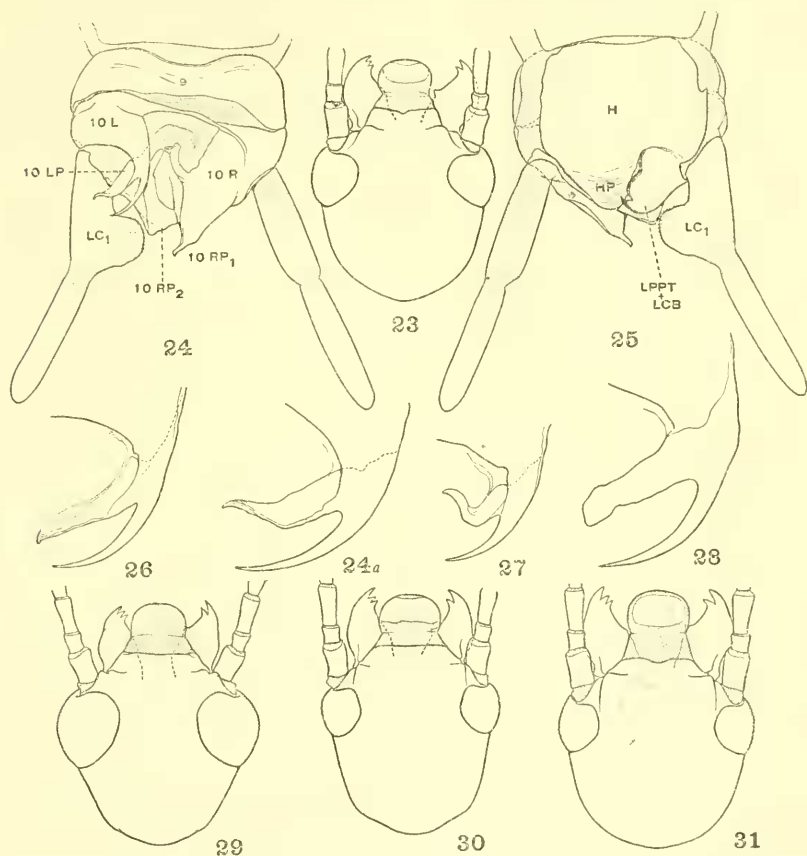
1. One male, Caracas, Venezuela, collected in plant quarantine at Washington, D. C., May 3, 1939, in a shipment of *Cattleya* (U.S.N.M.).

This male differs from those from Trinidad in its larger, more elongate head (fig. 23 vs. 29) with much smaller eyes; the sides behind the eyes are longer, more arcuate, but much less convergent; the caudal margin is somewhat acutely rounded medially, and laterally continuously arcuate with the sides. The left tergal process (10 LP) (fig. 24A) appears to be larger and to differ in shape. The much larger size (length 11.5 mm.; forewing length 7.5 mm., breadth 2 mm.) may prove to be an additional characteristic.

The entire terminalia, dorsal and ventral aspects, are shown in the accompanying figures (figs. 24, 25). As pointed out above, this specimen is probably taxonomically identical to the type of *Oligotoma flavicollis* Krauss.

2. One male, Medellín, Colombia, collected in plant quarantine at Hoboken, N. J., July 17, 1940, in a shipment of wild *Cattleya* (U.S.N.M.).

Differs from the Venezuela and Trinidad specimens in the form of the head and eyes (fig. 30) and the darker color. The head is more



FIGURES 23-25.—*Pararahagadochir trinitatis* subsp. ?, male (Venezuela): 23, Head; 24, terminalia (dorsal); 24a, detail of left tergal process (10 LP); 25, terminalia (ventral).

FIGURES 26, 29.—*Pararahagadochir trinitatis trinitatis* (Saussure), male (Trinidad): 26, Detail of 10 LP; 29, head.

FIGURES 27, 28, 30, 31.—*Pararahagadochir trinitatis* subsp. ? : 27, Detail of 10 LP; 28, detail of 10 LP; 30, head (specimen from Medellín, Colombia); 31, head (specimen from Río Frio, Colombia). Explanation of symbols on p. 403.

quadrate than either type, with the sides behind eyes scarcely arcuate or convergent; the caudal margin is more transverse with abruptly rounded sides; the eyes are still smaller than those of the Venezuela specimen and more abruptly inflated. The left tergal process (10 LP) (fig. 27) is small with the outer, flaplike portion doubled back medi-

ally toward the base. The size (length 10.5 mm.; forewing length 6.4 mm., breadth 1.8 mm.) is intermediate between that of specimens from the above localities.

Another specimen at hand from Colombia, without more definite data, is very similar to the above.

3. One male, Río Frío, Magdalena, Colombia, June 17 (Darlington) (MCZ).

Head similar to the Venezuelan specimen but shorter, evenly arcuate behind (fig. 31), and much lighter in color. Left tergal process (10 LP) (fig. 28) with outer portion not pointed, but irregularly expanded in outline distad.

PARARHAGADOCHIR TRINITATIS FLAVICOLLIS (Enderlein)

Embia flavicollis ENDERLEIN, 1909, p. 184.—KRAUSS, 1911, p. 68.—NAVÁS, 1918, p. 100.

Rhagadochir flavicollis (Enderlein) ENDERLEIN, 1912, pp. 56, 100, figs. 29, 30, pl. 3, I.

Pararhagadochir flavicollis (Enderlein) DAVIS, 1940a, p. 183, figs. 49-50 (after Enderlein).

Holotype.—Male, Stettiner Zoologischen Museum.

Type data.—Prov. Sara, Bolivia (J. Steinbach).

Paratype.—Male, with same data and disposition.

Remarks.—Enderlein's *flavicollis* was based upon specimens from both Bolivia and Venezuela. Since the Bolivian specimens are cited first, following his description, it is assumed that one of these should represent the holotype and thus that the Bolivian locality is to be regarded as the type locality of the subspecies. His specimen from Venezuela probably represented another subspecies as discussed above. Enderlein's original description and figures are inadequate, in the light of present knowledge, to characterize this subspecies, but it is assumed to be distinct because it is the only known *Pararhagadochir* from Bolivia with a bicolorous thorax. A reexamination of the type will be necessary to confirm the present placement or to determine whether it is not a distinct species.

PARARHAGADOCHIR TRACHELIA (Navás)

FIGURE 32-37

Rhagadochir trachelia NAVÁS, 1915, p. 135, fig. 9.

Embia trachelia (Navás) NAVÁS, 1918, p. 100, fig. 3; 1923a, p. 197 (record); 1924a, p. 10 (records); 1930, p. 72 (record).

Pararhagadochir trachelia (Navás) DAVIS, 1940a, p. 184, figs. 51-66 (part).

Navás's original description and figures of this species are so lacking in essential details that the identification by Davis of specimens appearing to represent the species could only be provisional. There has accordingly been a great need for a redescription of the holotype

based upon present standards. Through the great kindness of Dr. Max Biraben, of the La Plata Museum, the holotype of *trachelia*, as well as other specimens of the species, have been made available to the writer. The following description and the accompanying figures are based upon this Navás holotype.

Male (holotype, on slide).—Head, antennae, pterothorax, legs, wings, and abdominal terminalia medium chocolate brown; abdomen lighter brown; prothorax pale yellow; mandibles amber yellow, with brownish apices and inner margins; submentum reddish brown. Length 11.5 mm.; forewing length 7 mm., breadth 1.8 mm.

Head (fig. 32) large, broad, quadrate; eyes rather small, not strongly inflated, facets small, interspace equal to four eye widths; sides behind eyes two eye lengths long, nearly straight, gradually convergent, evenly rounded behind; caudal margin broad, obtusely rounded medially; mandibles similar to other species of *Pararhagadochir*; submentum with form as illustrated (fig. 33).

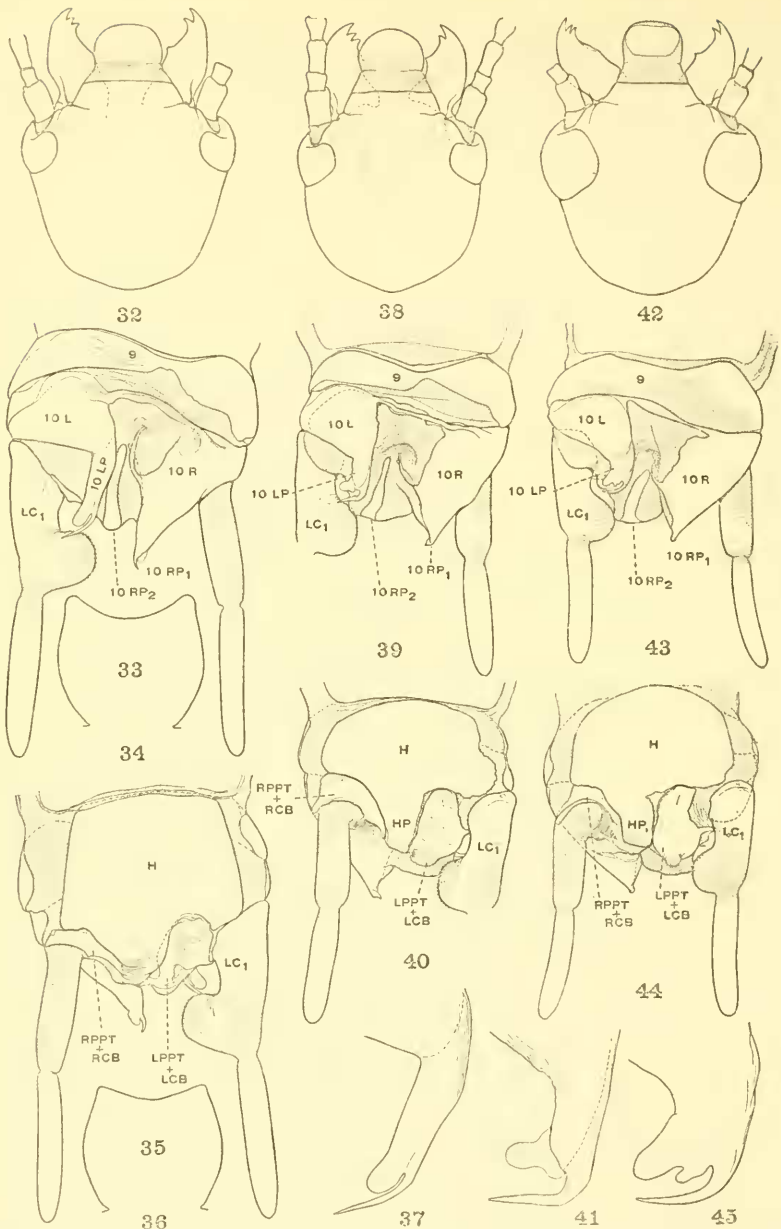
Wings with general features and venation similar to *trinitatis* from Colombia (pl. 18, B) but with three cross veins between R_1 and R_{2+3} in forewing, four in this position in hindwing; one cross vein between R_{2+3} and R_4 in both wings, this vein bordered by white.

Hind basitarsi with two sole-bladders, the second being very small, indistinct.

Terminalia (figs. 34, 36, 37): Left tergal process (10 LP) (fig. 37) greatly elongated, as long as width of 10 L, outer margin perpendicular to caudal margin of 10 L, parallel-sided; apex with a slender, gradually arcuate, talonlike inner process and an evenly rounded, submembranous outer lobe. Major right tergal process (10 RP₁) gradually tapered, bifid apically, the upper apex produced as a slender, sclerotic, downwardly curved spine, which is subtended by a vertical, membranous, disklike appendix. Ninth sternite (H) somewhat longer than broad, sides straight, parallel; process (HP) short, truncate, transversely wrinkled. Composite right cercus-basipodite and paraproct (RPPT+RCB) very dark brown, forming a half ring beneath base of left cercus, elongated toward left and fused to side of HP. Composite LCB and LPPT fused at base and inner side to H and HP, heavily sclerotized, without subechinulations on surface, inner apical angle with point indefinite. Cerci with form as illustrated, basal segment of right cercus almost wholly unpigmented.

Holotype.—Male, on slide,⁴ deposited in the La Plata Museum, Argentina.

⁴ When received the holotype was mounted dry on a pin. The specimen was carefully cleared in KOH (except one pair of wings) by the writer and mounted with the original labels on a slide in balsam to reveal specific details and to protect it from possible future damage.



FIGURES 32-37.—*Parahagadochir trachelia* (Navás), holotype male (except fig. 35) (Argentina): 32, Head; 33, outline of submentum; 34, terminalia (dorsal); 35, outline of submentum of specimen with dark prothorax; 36, terminalia (ventral); 37, process of left hemitergite (10 LP).

FIGURES 38-41.—*Parahagadochir birabeni* (Navás), holotype male (Argentina): 38, Head; 39, terminalia (dorsal); 40, terminalia (ventral); 41, process of left hemitergite (10 LP).

FIGURES 42-45.—*Parahagadochir tenuis* (Enderlein), plesiotype male (Bolivia): 42, Head; 43, terminalia (dorsal); 44, terminalia (ventral); 45, process of left hemitergite (10 LP).

Explanation of symbols on p. 403.

Type data.—The holotype bears four labels in the following top-to-bottom sequence: (1) "Rep. Argentina, Pr. Santiago d. Estero 190-, C. Bruch" (printed on bordered white paper); (2) "Typus" (printed on green card with border); (3) "Rhagadochis trachelius Nav." (hand-lettered on large label with green border); (4) "Rhagadochir trachelius Nav. Navás S. J. det." (on green paper, in Navás's hand?).

The numerous records for this species given by Navás have not been listed as his specimens were not prepared (see Davis, 1940a) and thus his determinations require verification to be of any value.

All the specimens studied by Davis (*l. c.*) appear to be referable to the new species described below.

The only additional specimen at hand, besides the holotype, which appears to be *trachelia*, is a male from Campo Santo, Salto, Argentina, March 13, 1939 (Biraben-Scott) (LPM). This specimen has relatively short wings, these being about half as long as the body instead of nearly equal length as in the holotype.

Reference to more specimens of this species will probably reveal the existence of a number of subspecies. Two Argentina specimens before the writer have structural characters similar to *trachelia* but differ in being darker brown with the prothorax brown instead of pale yellow. The head is darker, with the mandibles brown instead of amber yellow, and the submentum is very dark brown with a different form (fig. 35). One of these specimens is from Chilecito, La Rioja, February 20, 1939 (Biraben-Scott) (LPM) (retained by the writer); the other is from B. de Doria Sanogasta, La Rioja, February 21, 1939 (Biraben-Scott) (LPM). The small additional hind basitarsal bladder of *trachelia* cannot be located on these specimens. Further studies may indicate that such specimens represent a distinct subspecies.

PARARHAGADOCHIR SCHADEI, new species

FIGURES 50, 51

Holotype male.—Color (on slide): Head medium brown; antennae darker; mandibles and submentum pale amber yellow, tips and inner edges of mandibles reddish brown. Prothorax pale yellow; pterothorax, legs, and wings medium brown. Abdomen pale brown, terminalia medium brown. Length 8.5 mm. (on slide), forewing length 5.5 mm., breadth 1.3 mm.

Head (fig. 50) with form as illustrated; eyes large, inflated; sides of head strongly convergent behind, short.

Wings as throughout the genus; no cross veins between R_{4+5} and M.

Hind basitarsi without an inflated second sole-bladder but with a small, pale, membranous area in the expected position which possibly may become inflated at times.

Terminalia with the general form of *trachelia* but differing as follows: Left tergal process (10 LP) (fig. 51) much shorter, base scarcely as long as inner apical "talon," outer apical spatulate portion narrower; entire process gradually curving from base toward left. The basal segment of the right cercus only half as long as terminal segment (these segments are equal in *trachelia*).

Female.—Unknown.

Holotype.—Male, on slide, deposited in the Museum of Comparative Zoology, from Villa Rica, Paraguay, December (F. Schade).

Paratypes.—Four males from same locality and collector; two collected in December and two in October. Three are deposited in the Museum of Comparative Zoology, one in the writer's collection.

Remarks.—The form of the left tergal process as well as of the head and other features is very constant in the above series. The species is similar in appearance to *trachelia* but may be distinguished by characters of the head (compare figs. 32 and 50) and by the shape of 10 LP (compare figs. 37 and 51).

It is possible that *trachelia* and *schadei* may occur in the same region, as the specimen from Santiago del Estero, 10 km. from Lugones, Argentina (the same state as the holotype of *trachelia*), illustrated by Davis (1940a, figs. 51-57), appears to be referable to *schadei* and not to *trachelia*.

PARARHAGADOCHIR CONFUSA, new species

FIGURES 46-49

This new name is proposed for specimens apparently erroneously determined by Davis (1940a) as *P. argentina* (Navás). This species is now referred to the genus *Idioembia* of the Oligembiidae for reasons given in the discussion of the species. Davis's misidentification was probably due to the fact that his concept of the species was based on specimens in the Paris Museum apparently incorrectly identified as *argentina* by Navás himself.

Male.—Color (holotype, on slide): Head golden brown in frontoclypeal region, becoming medium brown caudally; antennae and palpi dark brown; mandibles straw yellow, tips and inner margins mahogany brown; submentum amber yellow. Prothorax, pterothorax, legs, wings, and terminalia medium brown. Length 11.0 mm. (on slide); forewing length 6.0 mm., breadth 1.6 mm.

Head (fig. 46) as figured, noticeably quadrate. Occipital foramen equilaterally triangulate, angles rounded, the anterior one broadly so.

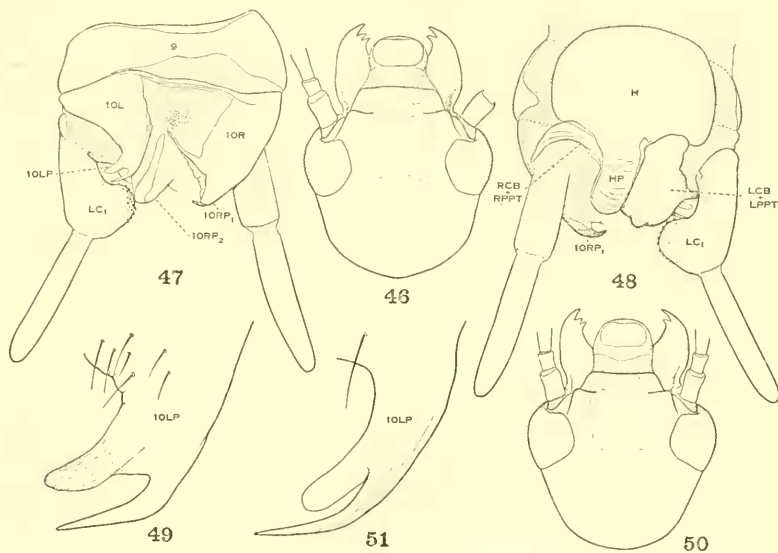
Wings as throughout the genus; forewing with four R_1 - R_{2+3} , one R_{2+3} - R_4 , and two R_{4+5} -M cross veins. Hindwing with similar cross veins.

Hind basitarsi with two large sole-bladders.

Terminalia (figs. 47–49) with usual generic structure. 10 LP (fig. 49) short, apical cleft as long as base, inner “talon” curved outward at base, thence straight, cleft broad, outer membranous portion “thumb-like”, with regular outlines. Tip of 10 RP₁ a stout, ventrally directed, sclerotic, darkly pigmented “talon.” Composite left paraprot (LPPT+LCB) without a prominent point on inner margin; apical margin submembranous, developed submedially as a domelike nodule which is densely microechinulate; outer apical angle narrowly produced partially around base of LC₁.

Female.—Unknown.

Holotype.—Male, on slide, deposited in the Museum of Comparative Zoology, from Villa Rica, Paraguay, March (F. Schade).



FIGURES 46–49.—*Pararhagadochir confusa*, new species, holotype male (Paraguay): 46, Head; 47, terminalia (dorsal); 48, terminalia (ventral); 49, detail of 10 LP.

FIGURES 50, 51.—*Pararhagadochir schadei*, new species, holotype male (Paraguay): 50, Head; 51, detail of 10 LP. Explanation of symbols on p. 403.

Paratypes.—Five topotypic males, on slides, collected during October, December, January, and February. Deposited in the Museum of Comparative Zoology and in the writer's collection.

Other records.—Davis (1940a), under the name *argentina* (Navás), records this species from Argentina—"Chaco de Santa Fé: Las Garzas, Bords du Río Las Garzas, 25 kil. O. [W.] d'Ocampo, E. R. Wagner, 1903 (2 males in Paris Museum)."

P. confusa is a member of the *birabeni-tenuis-davisi* series, having a unicolorous thorax, and may be distinguished by the shape of the left tergal process (compare figures), its lighter color, and numerous morphological details.

PARARHAGADOCHIR BIRABENI (Navás), new combination

FIGURE 38-41

Embia birabeni NAVÁS, 1918, p. 105, fig. 5.—DAVIS, 1940b, p. 352 (*Embolynta?*).

This species has been unrecognizable because of the inadequate original description and figures. Dr. Biraben has kindly sent the writer the holotype and a topotype male of this species, and thus it is now possible to reveal its characters in detail. The following re-description and accompanying figures are based upon the holotype of *birabeni*:

Male (holotype, on slide).—Rather uniform chocolate brown throughout (including prothorax); abdomen slightly paler. Length 9.5 mm.; forewing length 4.7 mm., breadth 1.2 mm.

Head (fig. 38) moderate sized, elongate-oval; eyes rather small, only slightly inflated, facets small, interspace equal to three eye widths; sides behind eyes gradually, convergently curved, increasingly so caudally to form a narrowly rounded caudal margin; mandibles as throughout the genus, but with slightly broader, shorter teeth, uniform light brown; submentum dark reddish brown, as long as broad, sides slightly arcuate, anterior margin shallowly emarginated.

Wings rather short and narrow with venation as throughout the genus; cross veins between R_1 and R_{2+3} obsolete; only one broad, white cross vein between R_{2+3} and R_4 .

Hind basitarsi rather short and stout; with two sole-bladders, the second small and situated at apical third.

Terminalia (figs. 39-41): Left tergal process (10 LP) (fig. 41) two-thirds as long as width of 10 L, inner margin continuous with the straight inner margin of 10 L, outer margin straight, parallel to central body axis; apex bifid, inner portion sclerotic, talonlike, abruptly curved outward nearly at a right angle, outer portion irregular, fleshy, membranous. Major right tergal process (10 RP₁) with apex produced as an abruptly downwardly curved sclerotic spine, without a ventral membranous appendix. Ninth sternite (H) much broader than long, caudal angles rounded; process (HP) twice as long as broad, membranous at apex, not wrinkled. Composite right cercus-basipodite and right paraproct (RCB+RPPT) a broad, darkly pigmented, ventral crescent; broadly fused along basal margin with side of HP. Composite LCB and LPPT very large, not definitely fused at base and inner side to H and HP; dilated terminally, with a ventral, subechinulated nodule at inner apical angle. Cerci with form as illustrated; inner nodule of LC₁ large, truncate.

Female (on slide).—Uniform chocolate brown throughout except head; head yellowish brown, especially ventrally. Length 12 mm. Head circular, with antennae 21-segmented (apparently complete). Hind basitarsi short, stout; with two large, nearly contiguous sole-

bladders; ventral setae rather short and sparse. Second segment of hind tarsi with very large echinulations on bladder. Cerci short, small; basal segment with a pigmented basal ring and with outer margin membranous.

Holotype.—Male, on slide, deposited in the La Plata Museum, Argentina.

Type data.—The holotype bears four hand-lettered labels in the following top-to-bottom sequence: (1) "Unquillo (Cordoba), Dr. Max Biraben" (on thin green paper); (2) "Typus" (on red paper); (3) "Embia Birabeni Nav." (on large, green-bordered label); (4) "Embia Birabeni Nav. P. Navás S. J. det." (on thin green paper—in Navás's hand?).

Neallotype (by present designation).—Topotype female, on slide, deposited in the La Plata Museum, Argentina, described above.

Other records.—One topotype male, on slide (LPM) (retained in writer's collection); one male, on slide, Cosquin, Sierra de Córdoba, Argentina, March 1-9, 1920, Cornell University Expedition (CU).

Remarks.—*P. birabeni* is most closely related to a specimen at hand identified below as *tenuis*. The two species are separable by the differences in the form of the left tergal process.

PARARHAGADOCHIR TENUIS (Enderlein)

FIGURES 42-45

Embia tenuis ENDERLEIN, 1909, p. 186.—KRAUSS, 1911, p. 69.—NAVÁS, 1918, p. 103.

Rhagadochir tenuis (Enderlein) ENDERLEIN, 1912, p. 60, figs. 34, 35, pl. 3K.

Pararhagadochir tenuis (Enderlein) DAVIS, 1940a, p. 188, fig. 80.

Rhagadochir tenuis var. *flaviceps* ENDERLEIN, 1912, p. 61.—NAVÁS, 1918, p. 104 (*Embia*).

Holotype.—Male, Stettiner Zoologischen Museum.

Type data.—Prov. Sara, Bolivia (J. Steinbach).

Plesiotype (by present designation).—Male, on slide, from Rurrenabaque, Bolivia, November 1921 (W. M. Mann), deposited in United States National Museum, described as follows:

Head medium brown, antennae and palpi dark chocolate brown, submentum reddish brown; mandibles straw yellow, apices reddish brown; wings, remainder of body, and appendages (except terminalia) lighter brown. Length 9 mm.; forewing length 5.7 mm., breadth 1.4 mm. Hind basitarsi with two sole-bladders; the second very small, pointed. Form of head and structure of terminalia as illustrated (figs. 42-45).

Other records.—Male paratypes with type data (Berlin and Stettin Mus.); 1 male paratype, Yungas, Brazil (Berlin Zool. Mus.).

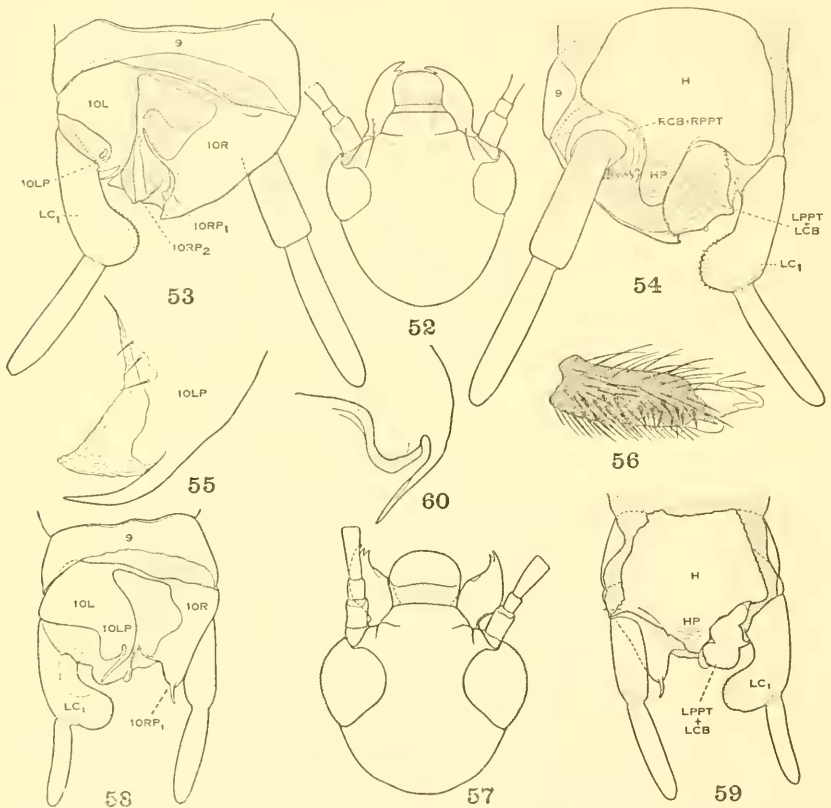
Remarks.—The identity of the above plesiotype is tentative and based only upon a comparison of its terminalia with Enderlein's figure of those of *tenuis*. The details of the left tergal process are somewhat discrepant.

PARAHAGADOCHIR DAVISI, new species

FIGURES 52-56

Male (holotype on slide).—Head and terminalia chocolate brown, body and legs medium brown throughout, wings light brown. Length 5 mm.; forewing length 3.6 mm., breadth 1.2 mm.

Head (fig. 52) broad, short; eyes large, inflated, interspace one and one-half eye widths wide; sides behind eyes short, strongly con-



FIGURES 52-56.—*Parahagadochir davisii*, new species, holotype male (Brazil): 52, Head; 53, terminalia (dorsal); 54, terminalia (ventral); 55, detail of left tergal process (10 LP); 56, hind basitarsus showing uninflated sole-bladder.

FIGURES 57-60.—*Parahagadochir surinamensis*, new species, holotype male (Surinam): 57, Head; 58, terminalia (dorsal); 59, terminalia (ventral); 60, process of left hemitergite (10 L). Explanation of symbols on p. 403.

vergent and arcuate, continuous with the narrowly rounded caudal margin; occipital foramen narrow, anterior margin transverse, feebly rounded; mandibles as throughout genus, apices reddish; submentum dark brown, with outline as indicated in figure.

Wings without special features. Hind basitarsi with a submedial, circular, membranous area on sole, but without an inflated bladder; chaetotaxy as figured (fig. 56).

Terminalia (figs. 53–55) dark brown throughout, with usual form of the genus. Left tergal process (10 LP) (fig. 55) distinctive, broad, short; outer membranous portion broadly triangular, evenly tapered caudad. Left paraproct (LPPT+LCB) simple; inner apical angle rounded, slightly lobed, minutely echinulate; outer apical angle slightly produced, truncate.

Female.—Unknown.

Holotype.—Male, on slide, deposited in the Museum of Comparative Zoology, from Parintins, Brazil, October 2, — (Parish).

Remarks.—This species is named for Dr. Consett Davis, who first described and illustrated the above holotype specimen as "*Pararhagadochir* sp. Indet." (Davis, 1940a, p. 187, figs. 76–79). It is now certain that the specimen represents a distinct new species, and through the kindness of Prof. Nathan Banks the writer was permitted to study the specimen.

P. davis may be recognized by its uniform dark brown color, the form of the head, 10 LP, and left paraproct, and by its distribution. It is a member of the *confusa-birabeni-tenuis* series.

PARARHAGADOCHIR SURINAMENSIS, new species

FIGURES 57–60

Male (on slide).—Uniform pale tan throughout (including prothorax); head medium brown, with yellowish mandibles; abdominal terminalia medium brown. Length 6.5 mm.; forewing length 4.5 mm., breadth 1.1 mm.

Head (fig. 57) somewhat larger than terminalia, short, circular, as long as broad across eyes; eyes very large, inflated, separated by interspace nearly equal to an eye width, facets prominent; sides behind eyes shorter than an eye length, moderately convergent and gradually rounded posteriorly to form a broad caudal margin; occipital foramen rounded anteriorly; submentum of same color as head, quadrate, sides slightly arcuate, anterior margin scarcely emarginated.

Wings pale, with broad hyaline stripes; with characteristic *Pararhagadochir* venation and few cross veins.

Hind basitarsi with only one sole-bladder.

Terminalia (figs. 58–60) with process of left hemitergite (10 LP) (fig. 60) very broad basally; inner talonlike portion narrow, scarcely acuminate, not curved apically; outer broad portion only half as long as "talon," very broad, fleshy. Right hemitergite (10 R) deeply excised on inner margin; caudal angle (10 RP₁) broadly rounded, thumblike with a narrow, terminal, spinelike appendix; inner pro-

jection not prominent; median sclerite narrow. Hypandrium process (HP) poorly developed. Composite left paraproct and left cercus-basipodite (LPPT+LCB) strongly lobed terminally and extensively microechinulate along margin. Basal segment of left cercus (LC₁) with inner apical lobe elongate, echinulate; terminal segment very narrow, elongate.

Female.—Unknown.

Holotype.—Male, on slide, in Cornell University collection.

Type data.—Kwakoepron, Saramacca River, Surinam, June 8, 1927 (Cornell U., Lot. 760, Sub. 87).

Remarks.—This unique species may be distinguished from all others of the genus by its broad, circular head with large eyes and by the details of the left tergal process. The holotype specimen was referred to by Davis (1940a, p. 187), who believed it to be conspecific with his "sp. indet." (i. e., *davisi*) from Parintins, Brazil.

PARARHAGADOCHIR ADSPERSA (Enderlein)

Embia adspersa ENDERLEIN, 1909, p. 185.—KRAUSS, 1911, p. 69.—NAVÁS, 1918, p. 103.

Rhagadochir adspersa (Enderlein) ENDERLEIN, 1912, p. 58, figs. 32, 33.

Pararhagadochir adspersa (Enderlein) DAVIS, 1940a, p. 188, fig. 81.

Holotype.—Male, Stettiner Zoologischen Museum.

Type data.—Prov. Sara, Bolivia (J. Steinbach).

Remarks.—This is apparently a very distinct species characterized by the large acuminate, echinulate inner nodule of the left cercus and the large, broad, bilobed left tergal process. The condition of the right hemitergite is suggestive of that found in the genus *Microembia*. Future studies may indicate that the species is not a member of the genus *Pararhagadochir*.

Family ANISEMBIIDAE

Anisembiidae DAVIS, 1940e,⁵ p. 535.—ROSS, 1940b, p. 642.—DAVIS, 1940f, p. 681.

Mesembiinae ROSS 1940b, p. 643 (type genus: *Mesembia* Ross).

Anisembiinae ROSS, 1940b, p. 649 (type genus: *Anisembia* Krauss).

American Embioptera; the males with mandibles nondentate apically; the wings (when present) with R₄₊₅ simple; the basal segment of the left cercus nodulose and echinulate on inner side (except in *Saussurembia* Davis); the hind basitarsi of both sexes with only one sole-bladder. In the males of *Anisembia* and *Chelicerca* the left cercus is usually one-segmented and some species are apterous.

Type genus.—*Anisembia* Krauss.

Distribution.—South America to southern United States and West Indies.

⁵ Davis's 15-day prior use of the name Anisembiidae (1940e) was due to an unexpectedly earlier mailing date of his publication.

Members of this family can be separated from other American species, which have the wing vein R_{4+5} simple, by the nondentate mandibles and the usually clavate and echinulate left cercus.

With the discovery of a species of *Chelicerca* (described below) having the left cercus of the male two-segmented, the division of the family into two subfamilies on the basis of segmentation of the cercus becomes untenable (i. e., Mesembiinae, left cercus two-segmented, and Anisembiinae, left cercus one-segmented).

KEY TO GENERA OF ANISEMBIIDAE (MALES)

1. Basal segment of left cercus apically echinulate on inner side----- 2
 Basal segment of left cercus not echinulate----- Saussurembia
2. Left cercus usually 1-segmented; when 2-segmented terminal segment broadly attached basally and not equal in form to terminal segment of right cercus ----- 4
 Left cercus always 2-segmented, terminal segment similar to that of right cercus in form and basal attachment----- 3
3. Terminalia with processes of tenth tergite slender, unarmed; median cleft of tenth tergite narrow: process of hypandrium (H) small, truncate ----- Mesembia
 Processes of tenth tergite broad, rounded, often bearing small hooks; median cleft of tenth tergite usually very broad (when narrow, it is basally forked), membranous; process of hypandrium prominent, broad, thumb-like ----- Schizembia
4. Basal segment of right cercus cylindrical, not expanded basally, basal foramen simple; process of left hemitergite simple----- Anisembia
 Basal segment of right cercus somewhat laterally compressed, greatly expanded basally to form a complexly margined foramen; process of left hemitergite complex----- Chelicerca

Genus SAUSSUREMBIA Davis

Saussurembia DAVIS, 1940a, p. 191.—ROSS, 1940b, p. 647.

Saussurella DAVIS, 1939d, p. 573 (name preoccupied).

Genotype.—*Embia ruficollis* Saussure, by original designation.⁶

Distribution.—Central America and Colombia.

This genus comprises two species, which may be separated from all others of the family by the nonechinulate left cercus. The writer now has evidence that *Oligotoma venosa* Banks, of Cuba, recently placed in this genus by Davis, belongs in *Anisembia* (see *infra*).

SAUSSUREMBIA RUFICOLLIS (Saussure)

Embia ruficollis SAUSSURE, 1896b, p. 353.

Oligotoma ruficollis (Saussure) KRAUSS, 1911, p. 42, pl. 2, fig. 10.—ENDLREIN,

1912, p. 91.—NAVÁS, 1924b, p. 62, fig. 4.**—FRIEDERICHs, 1934, p. 417, fig. 6, a-b.*

Saussurella ruficollis (Saussure) DAVIS, 1939d, p. 573, figs. 1-4.**

Saussurembia ruficollis (Saussure) DAVIS, 1940a, p. 191.

⁶ Davis's concept of this species was based on a specimen, in the Paris Museum, from Costa Rica (Paul Serre, 1920).

Holotype.—Winged male, Muséum d'Histoire Naturelle, Geneva.
Type data.—Bugaba, Central America (Panama), 250–400 meters.

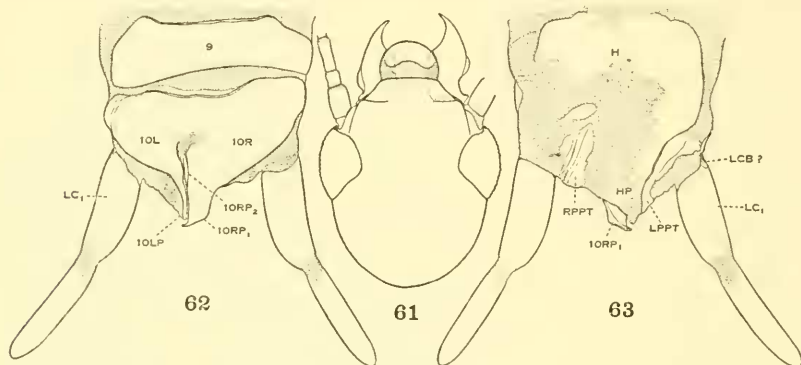
(See Krauss, 1911.)

Other records.—Mojica, Guanacaste, Río Blanco; Farm La Caja, near San José, Costa Rica (H. Schmidt) (Hamburg Museum)*; Costa Rica, 1921 (P. Serre).**

SAUSSUREMBIA SYMMETRICA, new species

FIGURES 61–63

Male holotype (on slide).—Head and basal antennal segment chocolate brown; first five succeeding antennal segments tan, terminal segments increasingly darker, becoming brown; mandibles medium brown,



FIGURES 61–63.—*Saussurembia symmetrica*, new species, holotype male (Colombia): 61, Head; 62, terminalia (dorsal); 63, terminalia (ventral). Explanation of symbols on p. 403.

tips golden brown; prothorax tan, pterothorax and hindlegs (other legs missing) medium brown; abdomen tan, terminalia only slightly darker, cerci pale tan. Length 5.5 mm.; forewing length 3.7 mm., breadth 0.9 mm.

Head (fig. 61, partially reconstructed—head capsule broken on right side): Elongate oval; eyes rather large, separated by interspace two eye widths wide, facets prominent, their interspaces unpigmented; sides behind eyes gradually, evenly arcuate behind, continuous with rounded caudal margin. Mandibles nearly equal in form, very acutely pointed apically, nondentate at tips or medially, outer basal angle abruptly rounded. Mentum unsclerotized, quadrate, slightly wider than long, sides weakly convergent behind. Antennae defective terminally.

Wings with typical anisembiid venation. Radius (R_1) gradually merging with costa, meeting it well before apex of wing. R_{2+3} and its petiole are the only remaining nonobsolete veins (except Cu_{1a}), the other veins being represented only by rows of macrotrichiae and

pigmented bands. One cross vein present between R_1 and R_{2+3} in forewings and hindwings, this located just beyond basal third of R_{2+3} . Hyaline stripes narrow, sharply defined.

Hind basitarsi with only one sole-bladder; ventral setae dense, long.

Terminalia (fig. 62, 63) relatively small, nearly symmetrical, weakly sclerotized and pigmented. Tenth tergite broadly triangular, divided submedially by a cleft, which becomes obsolete well before base of tergite, and forms two unequal hemitergites; left hemitergite (10 L) smallest, abruptly produced caudally on inner side as a narrow, acuminate, simple process (10 LP); right hemitergite (10 R) broad, large, gradually produced caudad as a broad, nearly parallel-sided process (10 RP_1), which is truncate, curved downward, and minutely hooked inward at apex; the inner margins of the two processes are nearly straight and closely parallel. Margin of basal half of 10 RP_1 with a narrow, simple, detached appendix (10 RP_2). Ninth sternite (H) greatly desclerotized, pigmented only across base and along left side, otherwise membranous; process (HP) obsolete, represented only as a membranous lobe, faintly pigmented on left side. Left paraproct (LPPT) elongate, inner margin lying close to margins of H and HP, outer margin irregular; right paraproct (RPPT) represented only as faintly pigmented, weakly wrinkled areas in membrane. Left cercus with basal segment (LC_1) unspecialized, cylindrical, without lobes or echinulations, slightly tapered distally, outer apical half membranous; a small sclerotized area at outer base may represent the left cercus basipodite (LCB?) fused to the cercus; terminal segment elongate, cylindrical, simple; right cercus similar to left cercus, the basal segment only slightly less pigmented.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56759.

Type data.—Río Frío, Colombia, February (W. M. Mann).

Remarks.—This remarkable species is tentatively assigned to *Saussurembia* Davis on the basis of its unmodified, nonechinulate left cercus. It may be separated at once from *Saussurembia ruficollis* (Saussure) by its incompletely cleft tenth tergite, the narrow left process (10 LP), the desclerotized ninth sternite, and the distally tapered LC_1 .

The abdominal terminalia of *symmetrica* are the most unspecialized of the Anisembiidae and rank with those of *Clotioda* as the most generalized of the order. They represent one more element in the pleasing phylogenetic series found in the Anisembiidae.

Genus MESEMBIA Ross

Mesembia Ross, 1940a, p. 12.—DAVIS, 1940d, p. 532.—ROSS, 1940b, p. 643.

Genotype.—*Oligotoma hospes* Myers, by original designation.

Distribution.—West Indies, Brazil.

The three species included in this genus have in common the simple, rather slender tergal processes of the terminalia; the short, simple, truncate process of the hypandrium; and the two-segmented left cercus with the basal segment inwardly lobed and echinulate. *M. aequalis* is only tentatively assigned to the genus. It probably is generically distinct, but a final conclusion must await further data.

KEY TO SPECIES OF MESEMBIA (MALES)

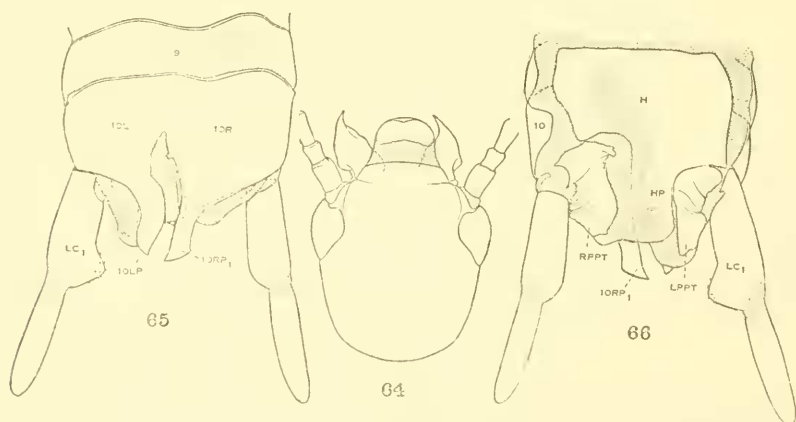
1. Left cercus with echinulate lobe located medially on inner side of basal segment; Cuba..... *hospes*
 Left cercus with echinulate lobe located distally on inner side of basal segment..... 2
2. Left tergal process very slender, abruptly directed mesad; tenth tergal cleft attaining base; Haiti..... *haitiana*
 Left tergal process as broad as or broader than the right process, slightly curved outward; tenth tergal cleft terminated just within basal half; southern Brazil..... *aequalis*

MESEMBIA AEQUALIS, new species

FIGURES 64-66

Male.—Color (in alcohol): Head and antennae black; legs, pterothorax, abdominal terminalia, and dorsal maculation mahogany brown; prothorax with yellowish intersclerotical areas, sclerites brown. Length 6.7 mm.; forewing length 4.0 mm.; breadth 1.0 mm.

Head (fig. 64) with eyes medium sized, scarcely inflated, separated by an interspace 3 eye widths wide; sides behind eyes $1\frac{1}{2}$ eye lengths long, nearly straight, gradually convergent; caudal margin abrupt, obtusely rounded. Mandibles small, sharply pointed; left mandible with inner margin biemarginate, the right with inner margin evenly arcuate. Occipital foramen rounded anteriorly. Antennae darkly pigmented throughout, 17-segmented (broken).



FIGURES 64-66.—*Mesembia aequalis*, new species, holotype male (Brazil): 64, Head; 65, terminalia (dorsal); 66, terminalia (ventral). Explanation of symbols on p. 403.

Wings light brown, hyaline stripes very narrow, sharply defined. R_1 narrow, paralleling costa but merging with it apically. One or two cross veins present between R_1 and R_{2+3} , one between R_{2+3} and R_{4+5} . Venation otherwise without peculiarities.

Terminalia (fig. 65, 66) with tenth tergite large, quadrate, simple; submedian cleft slightly to left of middle, terminating just within basal half; left process (10 LP) rather broad, parallel-sided, thin, simple, directed caudad but curved upward distad, abruptly pointed at apex; right hemitergite (10 R) large, its major process (10 RP_1) abruptly produced at inner apical angle, parallel-sided, sclerotic, slightly curved downward distad, apex slightly expanded, truncate, and slanted mesad; secondary process (10 RP_2) very narrow, paralleling, and lying partially beneath, inner margin of 10 R. Ninth sternite (H) quadrate, right apical area submembranous; process (HP) short, truncate, wrinkled, submembranous on right side basally. Composite left cercus-basipodite and left paraproct (LCB+LPPT) prominent, darkly pigmented, elongate, fused basally with H; composite RCB and RPPT equally prominent but of a different shape. Basal segment of left cercus (LC_1) cylindrical basally abruptly expanded distally on inner side to form a prominent, sparsely echinulate lobe; terminal segment of left cercus normal. Basal segment of right cercus simple, cylindrical, slightly swollen distad; basal foramen circular, simple; terminal segment similar to that of LC.

Female.—Unknown.

Holotype.—Male, on slide, U. S. N. M. No. 56581.

Type data.—Nova Teutonia, Santa Catharina, Brazil (F. Plau-mann).

Paratypes.—Two males, on slides, with holotype data; one deposited in the writer's collection, the other in the California Academy of Sciences.

Remarks.—This distinct species is the most southern and one of the most generalized of the family. Its characters, except for the echinulate lobe of the left cercus, are very similar to those of *Saussurembia ruficollis* (Saussure).

MESEMBIA HOSPES (Myers)

Oligotoma hospes MYERS, 1928, p. 89, fig. 1.

Mesembia hospes (Myers) ROSS, 1940a, p. 12.—DAVIS, 1940d, p. 532, figs. 20–23.—ROSS, 1940b, p. 644, figs. 14–16.

Holotype.—Winged male, in Museum of Comparative Zoology (type No. 523).

Type data.—Soledad, Santa Clara, Cuba, February 10, 1925 (J. G. Myers).

Other records.—Paratypes with same data.

MESEMBIA HAITIANA Ross

Mesembia haitiana Ross, 1940b, p. 646, figs. 17-19.

Holotype.—Winged male, on slide, U.S.N.M. No. 53132.

Type data.—Grosmore, Haiti, February 17, 1926 (C. H. Leonard).

Genus SCHIZEMBIA, new genus

Males.—Winged; small to moderate sized. Dark chocolate brown; prothorax yellow; wings dark brown. Head without maculation; eyes medium to large sized; mandibles small, without apical dentations, tips acutely pointed, inner margins evenly arcuate. Submentum quadrate, somewhat longer than broad, not heavily sclerotized; mentum distinct, pigmented. Wings with R_1 narrow, closely paralleling costal margin and meeting it before apex; radial sector, R_{2+3} . M_1 and Cu_{1a} simple. Hind basitarsi with only one bladder; plantar setae very fine. Terminalia with tenth tergite divided into hemitergites by a suture complete to basal margin; processes of each hemitergite short, broad, blunt, complex apically (fused apically in one species). Ninth sternite with a short, broad, rounded process. Composite left cercus-basipodite and left paraproct represented by a free triangular sclerite. Left cercus two-segmented; basal segment nodulose and echinulate on inner side apically. Right cercus two-segmented, basal segment cylindrical.

Female.—No specimens definitely associated with a male.

Genotype.—*Schizembia grandis*, new species.

Distribution.—Colombia, Venezuela, and Trinidad. This is the only genus of Embioptera, except *Mesembia* and *Saussurembia*, indigenous to South America that has oligotomoid wing venation (R_{1+5} simple).⁷ It can be separated at once from the introduced species of *Oligotoma*, which have similar venation, by its nondentate mandibles, echinulate left cercus, completely cleft tenth tergite, and the blunt, short process of the right hemitergite.

The three known species of *Schizembia* may be separated by means of the following key:

KEY TO SPECIES OF SCHIZEMBIA (MALES)

1. Tergal processes separated apically by a broad membranous cleft, which continues to base of tergite----- 2
- Tergal processes fused apically, membranous cleft narrow, Y-shaped, isolating a broad, medial sclerite; Trinidad----- callani
2. Size large (10 mm. long); process of hypandrium evenly rounded apically, marginal flange, narrow, even----- grandis
- Size small (6.5 mm. long); process of hypandrium acutely pointed apically, marginal flange greatly developed laterally----- minuta

⁷ *Calamoclostes albistriolatus* Enderlein of the Embiidae has R_{1+5} simple in the forewing and forked in the hindwing.

SCHIZEMBIA GRANDIS, new species

PLATE 19, B; FIGURES 67-69

Male.—Color (in alcohol): Pterothorax, abdomen, legs, wings, head, palpi, and basal antennal segment dark chocolate brown; prothorax reddish yellow; antennal segments 2-14 tan, terminal segments brown. Length 10 mm.; forewing length 8 mm.; breadth 1.8 mm.

Head (fig. 67) small but larger than terminalia; sides behind eyes straight, rather strongly convergent caudad, abruptly rounded and somewhat transverse behind. Eyes moderately large, inflated; interspace twice as wide as an eye width. Antennae with 23 segments (probably complete).

Wings (pl. 19, B) very large, broad. Radius unusually narrow; bordering bands very narrow, pigment granules small, dull red. Radial sector forked within basal half of wing; R_{2+3} pigmented to margin, R_{4+5} pigmented at extreme base only. M and Cu_{1a} each represented only by a row of setae. Cu_{1b} narrow. Anal vein present as a short basal rudiment, united by a cross vein to common base of cubitus and media. Cross veins absent in remainder of wing except for four between R_1 and R_{2+3} . Color uniform dark brown; hyaline stripes very narrow and sharply defined.

Terminalia (figs. 68, 69) very small in relation to other body proportions. Cleft of tenth tergite complete, very broad, membranous, microreticulate in caudal half. Process of left hemitergite (10 LP) broad, bearing a small hook at outer apical margin. Inner margin of right hemitergite (10 R) irregular, deeply notched at apical third; process (10 RP) complex. Ninth sternite (H) subquadrate, bearing long setae; process (HP) nearly symmetrical, short, broadly rounded, margined apically by an internal narrow flange, surface wrinkled. Composite left paraproct and left cercus-basipodite (LPPT+LCB) represented by a free, heavily sclerotized, narrow sclerite; right paraproct obsolete. Basal segment of left cercus (LC_1) gradually inflated terminally on inner side, bearing numerous echinulations. Basal segment of right cercus cylindrical.⁸ Terminal segments of both cerci equal.

Female.—No specimens definitely associated with a male.

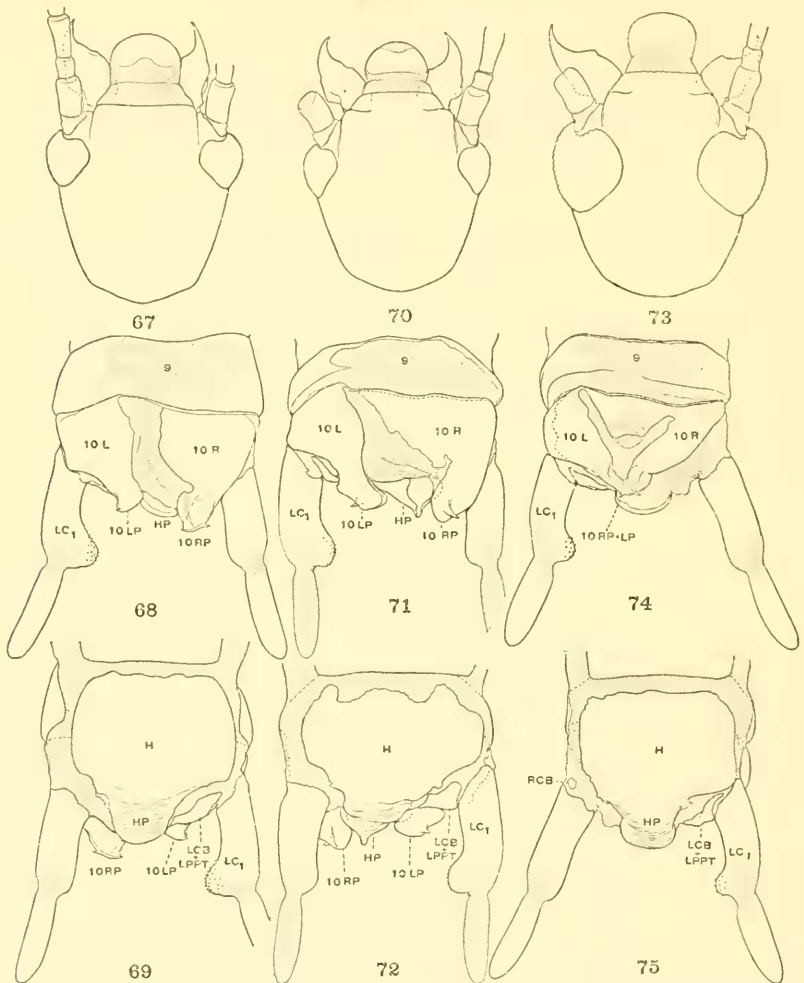
Holotype.—Winged male, on slide, U.S.N.M. No. 56044.

Type data.—Collected in a shipment of *Cattleya* from Caracas, Venezuela, in plant quarantine at Washington, D. C., May 4, 1939 (Inspectors Sanford and Adams).

Other records.—Three males, all collected in wild *Cattleya* in plant quarantine at Washington, D. C. — two of these in shipments from

⁸The inner surface of the basal segment of the right cercus of one of the available specimens bears four distinct peglike echinulations, which are absent in the other specimens at hand.

Caracas, Venezuela, June 9, 1938, and May 4, 1939, and one from Medellín, Colombia, May 4, 1939. One female was collected under similar circumstances in a shipment from Caracas, Venezuela, September 17, 1937. One male from Caracas is retained in the writer's



FIGURES 67-69.—*Schizembia grandis*, new genus and species, holotype male (Venezuela): 67, Head; 68, terminalia (dorsal); 69, terminalia (ventral).

FIGURES 70-72.—*Schizembia minuta*, new species, holotype male (Colombia): 70, Head; 71, terminalia (dorsal); 72, terminalia (ventral).

FIGURES 73-75.—*Schizembia callani*, new species, holotype male (Trinidad): 73, Head; 74, terminalia (dorsal); 75, terminalia (ventral). Explanation of symbols on p. 403.

collection; the other specimens are returned to the United States National Museum. None are made paratypes because of imperfect condition or slightly discrepant structure.

Remarks.—In general appearance, particularly by virtue of its yellow prothorax and size, this species resembles subspecies (?) of the *Pararhagadochir trinitatis* complex that occur in the same region. The female cited above, which appears to be of this species, can be separated from those of *Pararhagadochir* by the absence of a second hind basitarsal sole-bladder and the evenly pigmented basal segments of the cerci.

SCHIZEMBIA MINUTA, new species

FIGURES 70-72

Male.—Color (in alcohol): Head, antennae, pterothorax, and terminalia chocolate brown; wings and abdomen light brown; prothorax reddish yellow; femora bicolorous, basal three-fourths pale yellow, terminal fourth brown; cerci with apex of basal segment and entire terminal segment pale yellow. Length 6.5 mm.; forewing length 4 mm., breadth 1 mm.

Head (fig. 70) shorter and broader than in *grandis*; with sides slightly rounded, gradually convergent caudad, abruptly rounded and transverse behind. Eyes as in *grandis*. Antennae 19-segmented (apparently complete).

Wings relatively small. Radius with bordering bands, broad; not parallel to costal margin but converging toward it and meeting it well before apex of wing. Radial sector forked midway in wing. Venation otherwise similar to that of *grandis* except only one nearly obsolete cross vein is present between R_1 and R_{2+3} . Color uniform light brown; hyaline stripes very narrow and sharply defined.

Terminalia (figs. 71, 72) small; similar in general structure to that of *grandis*, but differing in details of tergal processes as illustrated, and the process of the ninth sternite (H), which is longer and narrower, with the corners of the apex strongly turned inward so as to nearly meet and form a tube; ventrally the apex of the process bears a small lobe. Composite left cercus-basipodite and left paraproct large, triangulate. Terminal segments of both cerci and apices of basal segments very pale yellow.

Female.—No specimens associated with male.

Holotype.—Winged male, on slide, U.S.N.M. No. 56045.

Type data.—With *Cattleya* in cargo from Medellín, Colombia, in plant quarantine at Hoboken, N. J., October 15, 1941 (Inspector Sanford).

Paratype.—Collected in an express shipment of wild orchids from Medellín, Colombia, in plant quarantine at Washington, D. C., August 28, 1936 (Inspector Adams), deposited in writer's collection.

SCHIZEMBIA CALLANI, new species

FIGURES 73-75

Male.—Color (on slide): Head and basal antennal segments dark chocolate brown; pterothorax, legs, and terminalia medium chocolate brown, abdomen and wings lighter; prothorax and forecoxae pale straw yellow; mandibles golden yellow. Length 7 mm.; forewing length 4.5 mm., breadth 1.2 mm.

Head (fig. 73) larger than terminalia; sides behind eyes gradually rounded and convergent, short; caudal margin broad, evenly arcuate. Eyes very large, inflated; facets prominent; interspace equal to an eye width.

Wings relatively large, broad. Radius narrow, converging toward costa and nearly merging with it before wing apex. Three cross veins present between R and R₂₊₃ in forewing and two in hindwing—absent elsewhere except one between Cu_{1b} and A. R₂₊₃ strongly represented to terminus. R₄₊₅ well represented at extreme base only, its terminal portion, as well as all other veins behind it (except Cu_{1b}), each represented only by a row of macrotrichiae. Color uniform; hyaline stripes very narrow and sharply defined.

Terminalia (figs. 74, 75) small. Tenth tergite with median cleft incomplete apically, processes fused; cleft forked, the left fork extending from middle at a 45° angle to basal margin, narrow; the right fork extending basad at same angle, but terminated well before basal margin; these clefts isolate a broad, median, basal area, truncate apically with the adjacent membrane granulate. Processes narrowly fused on inner side apically; with small lateral apical projections. Ninth sternite (H) quadrate, basal margin ragged; produced apically as a symmetrical, broadly rounded process (HP). Two rudimentary sclerites fused to either side of H at base of HP may represent the left and right paraprocts. A free, triangular sclerite in membrane between HP and base of left cercus may represent the composite left cercus-basipodite and left paraproct (LCB+LPPT). Right cercus-basipodite (RCB) represented by an isolated, small, circular, ventral sclerite. Basal segment of left cercus (LC₁) stout, slightly clavate on inner side apically, this nodule bearing a few scattered echinulations; terminal segment of left cercus large. Basal segment of right cercus cylindrical, darkly pigmented on inner side; terminal segment narrower and smaller than that of left cercus.

Female.—Unknown.

Holotype.—Male, on slide, deposited in the British Museum of Natural History.

Type data.—Collected at light, St. Augustine, Trinidad, June 4, 1939 (E. McC. Callan).

Remarks.—This species is named after the collector, Dr. Edward McC. Callan, of St. Augustine, Trinidad, who sent the writer much valuable material for this study.

The cleavage of the tenth tergite of this species is very remarkable; the right fork is apparently an extension of the notch that appears along the inner margin of the right hemitergite in other species of *Schizembia* and in the genus *Chelicerca*.

Genus ANISEMBIA Krauss

Anisembia KRAUSS, 1911, p. 74.—ENDERLEIN, 1912, p. 109 (= *Oligotoma* and *Haploembia*).—CHAMBERLAIN, 1923, p. 346.—DAVIS, 1940d, p. 531.—ROSS, 1940b, p. 649.

Genotype.—*Embia texana* Melander, by original designation.

Distribution.—Cuba, south-central United States, and Baja California, Mexico.

At this time the writer is limiting this genus to the three species treated below. Species of the subgenera *Chelicerca* Ross and *Dactylocerca* Ross, which are much more complex, have been removed as they appear to be derived from a different stock. This is evidenced by the discovery of a new species of the same series that has a two-segmented left cercus. It is thus likely that the one-segmented left cercus has appeared twice within the family on different evolutionary lines. *Anisembia* was probably derived from *Mesembia*-like ancestors.

The genus *Anisembia* Krauss is here restricted to include only those species having an apically pointed occipital foramen; a one-segmented left cercus; a simple, incomplete tenth tergal cleft; a simple left tergal process (10 LP); a short, unmodified process of the hypandrium (HP); and the basal segment of the right cercus cylindrical, with a simple, circular basal foramen.

KEY TO SUBGENERA AND SPECIES OF ANISEMBIA (MALES)

1. Inner nodule of left cercus small, very sparsely echinulate; head scarcely larger than terminalia (*Anisembia*, s. str.)----- 2
Inner nodule of left cercus large, rounded, very densely echinulate; head distinctly larger than terminalia; Baja California, Mexico
A. (Bulbocerca) sini
2. Process of left hemitergite rather short, extending straight caudad; process of right hemitergite tapered; medium sized; United States
A. (Anisembia) texana
Process of left hemitergite very long, strongly curved toward left; process of right hemitergite truncate; small-sized; Cuba---- *A. (Anisembia) venosa*

Subgenus ANISEMBIA, sensu stricto

ANISEMBIA (ANISEMBIA) TEXANA (Melander)

Embia texana MELANDER, 1902, p. 19, figs. 2, 3; 1903, p. 99, figs. 1, 2.—FRIEDERICHs, 1906, p. 238.

Anisembia texana (Melander) KRAUSS, 1911, p. 74, fig. F.—CHAMBERLIN, 1923, p. 345.—DAVIS, 1940d, p. 532.—SANDERSON, 1941, p. 60 (record).

Oligotoma texana (Melander) ENDERLEIN, 1912, pp. 92, 109, fig. 62.—MILLS, 1932, p. 648, figs. 1-4.

Anisembia (Anisembia) texana (Melander) Ross, 1940b, p. 650, figs. 20-22, 28.

Holotype.—"Immature male" (or female?) in Museum of Comparative Zoology (type No. 1639).

Type data.—Austin, Tex. (A. L. Melander).

Plesiotypes.—Alate male, in United States National Museum, from Victoria, Tex.; and mature female, California Academy of Sciences, from Arroyo Salado, Starr County, Tex. Both designated and described by Ross (1940b).

Distribution.—Texas, Louisiana, Mississippi, and Arkansas.

New records.—TEXAS: San Antonio, New Braunfels, Sequin, Texarkana. LOUISIANA: Monroe. All collected by the writer.

Remarks.—This is a very common species and, although often encountered under stones, is oftenest found on the bark of trees, especially that of oaks with a rough surface. At Monroe, La., colonies of the insect were very conspicuous on the shaded surface of large oaks bordering the city streets.

The writer has recently had opportunity to study in detail the biology of this species in the field and in laboratory cultures. An interesting fact was noted in connection with the wingless condition of certain of the males. A careful examination of the thorax of the apterous male revealed that small wing pads are actually developed and a slight modification of the scuta of the mesothorax and metathorax is evident. It appears that the apterous condition in males of *texana* results from a halting of the wing development (probably at a stage comparable to the third instar of normal winged males), while other male features develop in a normal manner. This condition is precisely the same in apterous males of *Oligotoma japonica* Okajima, which the writer has studied in large numbers. This subapterous condition may prove to be characteristic of all species having dimorphic males, as males of those species which never have winged males have the scuta identical to the female, with no trace of wing pads.

ANISEMBIA (ANISEMBIA) VENOSA (Banks)

FIGURES 76-79

Oligotoma venosa BANKS, 1924, p. 421, pl. 1, figs. 10, 13.

Saussurella venosa (Banks) DAVIS, 1939d, p. 574, figs. 5-7.

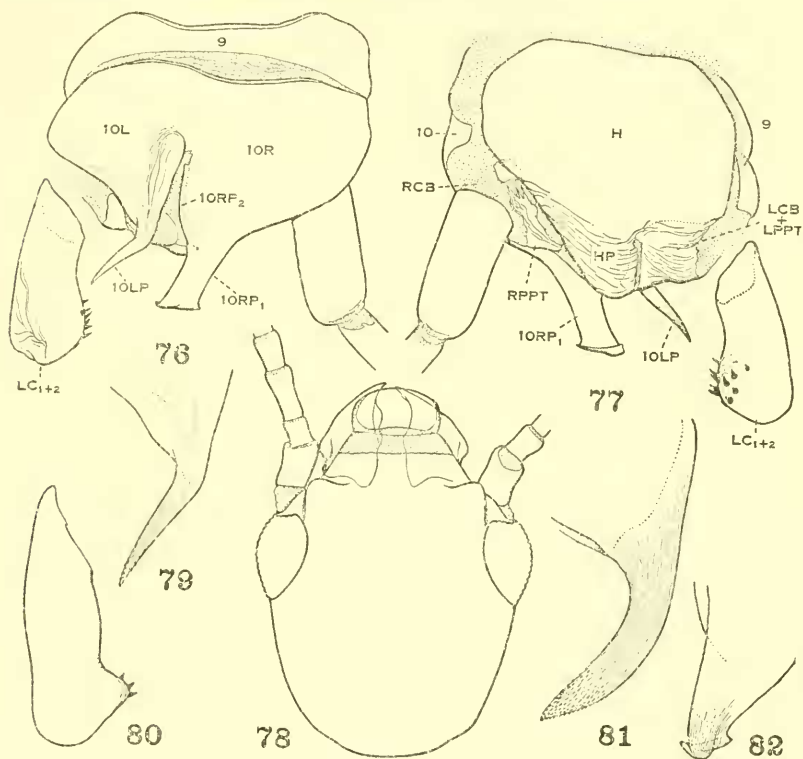
Saussurembia (♀) *venosa* (Banks) ROSS, 1940b, p. 648.

Anisembia (Anisembia) schwarzi Ross, 1940b, p. 652, figs. 2, 23-25 (Cayamas, Santa Clara, Cuba) (new synonym).

Holotype.—Male, on slide, Museum of Comparative Zoology (No. 14879).

Type data.—Santa Clara, Cuba (Baker).

Remarks.—The holotype of this species, mounted on a slide in balsam, was in such poor condition that Davis (1939d) was unable to establish with certainty the generic position of the species or adequately to redescribe the terminalia. Recently, through the kindness of Dr. Banks, the writer has been able to remount the fragmentary specimen after first treating the parts in KOH. Many essential details of the terminalia are now visible, and it is apparent, by comparing holotypes, that *Anisembia schwarzi* Ross is with little doubt a synonym of *venosa*. The details of the head and terminalia of the holotype of *venosa* are shown in the accompanying figures.



FIGURES 76-79.—*Anisembia venosa* (Banks), holotype male (Cuba): 76, Terminalia (dorsal); 77, terminalia (ventral); 78, head; 79, detail of left tergal process (10 LP).

FIGURES 80-82.—*Anisembia venosa* (Banks), holotype of synonym *schwarzi* Ross (Cuba): 80, Left cercus; 81, left tergal process; 82, tip of right tergal process (10 RP₁). Explanation of symbols on p. 403.

The holotypes of *venosa* and *schwarzi* differ in a number of striking details, which, however, because the specimens are from the same state of Cuba, are regarded as interspecific variation. The shape of the left tergal process (10 LP) is quite different and may not be due to the angle of view (cf. figs. 79 and 81). The lobe of the left cercus

is more pointed and has fewer teeth in the holotype of *schwarzi* and is broadly rounded with many more teeth in the holotype of *venosa*; in the figure of the latter structure (fig. 76) the cercus is foreshortened. The shape of the right tergal process (10 RP₁) is probably similar in the two specimens. That of the holotype of *schwarzi* (Ross, 1940b, fig. 24) is curved downward and inward (probably the true position) and thus presents a different appearance. A detail not noted in the description of *schwarzi* is that the terminal half of 10 LP is peculiarly roughened with hairlike projections of the derm as figured; this is evident also in the *venosa* holotype.

Subgenus BULBOCERCA Ross

Bulbocerca Ross, 1940b, p. 654.

ANISEMBIA (BULBOCERCA) SINI Chamberlin

Anisembia sini CHAMBERLIN, 1923, p. 346, figs. a-b.—DAVIS, 1940d, p. 532, fig. 19.
Anisembia (Bulbocerca) sini (Chamberlin) Ross, 1940b, p. 654, figs. 32-34.

Holotype.—Apterous male, on slide (No. 1245), and *allotype* female, on slide (No. 1246), California Academy of Sciences.

Type data.—Loreto, Baja California, Mexico.

Distribution.—Central Baja California, Mexico (supported by many records), and islands of Gulf of California (by occurrence of silk tunnels).

Genus CHELICERCA Ross

Chelicerca Ross, 1940b, p. 656 (subgenus of *Anisembia* Krauss).

Males.—Winged or apterous. Head dark, eyes small to large, occipital foramen rounded anteriorly. Terminalia with cleft of tenth tergite complete to base, right margin irregular, often excised; left tergal process (10 L) complex, outer apical margin twisted ventrad; right hemitergite (10 R) large, often terminated caudad in one or more talonlike hooks curved to right; process of hypandrium (HP) broad, complex apically, often armed with echinulations or nodules; left cercus usually one-segmented (except in one species); basal segment of right cercus somewhat laterally compressed, expanded basad, its basal foramen irregular, complex.

Genotype.—*Anisembia (Chelicerca) davisii* Ross, by original designation.

Distribution.—Mexico, Southwestern United States.

In this genus are found some of the most specialized species of the family. The discovery of *dampfi* from Chiapas, Mexico, with its two-segmented left cercus, gives cause for separating this series of species from that of the genus *Anisembia*. The terminalia of *dampfi* are nearly as complex as in *davisii* in spite of the more primi-

tive cercus, and since species of the genus *Anisembia* have much more generalized terminalia than any *Chelicerca*, it appears that the one-segmented condition was attained independently in the two genera.

The component subgenera, *Protochelicerca*, *Chelicerca*, and *Dactylocerca*, seem to form a very natural evolutionary series, exhibiting increasing specialization of the abdominal terminalia (e. g., the left cercus), which seems to be directly derived from more primitive genera of the south such as *Schizembia*.

The specialization of the left cercus corresponds with a serial specialization of other terminal abdominal structures in the species and with the degree of their geographic separation from the region of probable origin (northern South America). The most specialized species of the series, *rubra*, occurs in the Sonoran region of North America, which has probably presented more selective environmental changes than the Tropics.

KEY TO SUBGENERA AND SPECIES OF CHELICERCA (MALES)

1. Left cercus 1-segmented..... 2
 Left cercus 2-segmented..... C. (*Protochelicerca*) *dampfi*
2. Right hemitergite produced caudad as a distinct process bearing 1 or 2 outwardly curved, clawlike hooks; left cercus not greatly elongated or very strongly inwardly arcuate (subgenus *Chelicerca*, s. str.)..... 3
 Right hemitergite not produced caudad as a process and not bearing clawlike apical hooks; left cercus greatly elongated, strongly inwardly arcuate
 C. (*Dactylocerca*) *rubra*
3. Process of right hemitergite with but 1 outwardly curved, clawlike apical hook..... 4
 Process of right hemitergite with 2 such hooks.... C. (*Chelicerca*) *heymonsi*
4. Apical hook of process of right hemitergite arising on inner side of process and curving across its apex..... C. (*Chelicerca*) *wheeleri*
 Apical hook arising terminally, not overlapping any tergal structure..... 5
5. Left apical angle of process of hypandrium (HP) produced as a distinct, thumblike, densely echinulate knob..... C. (*Chelicerca*) *nodulosa*
 Left apical angle of process of hypandrium (HP) less strongly produced, pointed, without echinulations..... C. (*Chelicerca*) *davisi*

Subgenus PROTOCHELICERCA, new subgenus

Males.—Rather large, winged. Head larger than terminalia; eyes very large, inflated; occipital foramen evenly rounded apically. Wings large, broad; R_1 narrow, closely paralleling costal margin and meeting it apically, apex not joining R_{2+3} by means of a cross vein; three cross veins present between R_1 and R_{2+3} in forewing, two in hindwing. Terminalia very similar to those found in *Chelicerca*, s. str., but with the left cercus distinctly two-segmented, the terminal segment rather small, broad basally.

Type.—*Chelicerca* (*Protochelicerca*) *dampfi*, new species.

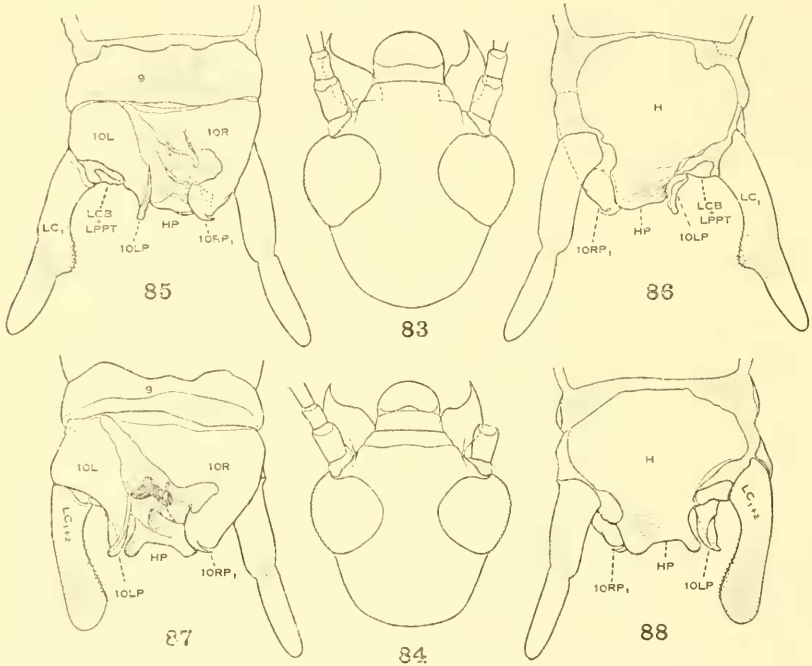
Distribution.—That of the single species.

CHELICERCA (PROTOCHELICERCA) DAMPFI, new species.

FIGURES 83, 85, 86

Male.—Color (on slide): Head, antennae, foretibiae, pterothorax, and terminalia medium brown; remainder of body and appendages, except prothorax, tan; prothorax pale straw yellow. Length 7.5 mm.; forewing length 5.8 mm., breadth 1.4 mm.

Head (fig. 83) with eyes very large, strongly inflated, separated by an interspace distinctly narrower than an eye width; sides behind eyes short, slightly arcuate, strongly convergent, continuous with the



FIGURES 83, 85, 86.—*Chelicerca (Protochelicerca) dampfi*, new subgenus and species, holotype male (Chiapas): 83, Head; 85, terminalia (dorsal); 86, terminalia (ventral).

FIGURES 84, 87, 88.—*Chelicerca (Chelicerca) nodulosa*, new species, holotype male (Veracruz): 84, Head; 87, terminalia (dorsal); 88, terminalia (ventral). Explanation of symbols on p. 403.

evenly rounded caudal margin. Mandibles moderate sized, apices very sharply pointed, inner margins evenly inwardly arcuate. Antennae strongly pigmented throughout.

Wings relatively broad, light brown; hyaline stripes narrow, sharply defined. Three cross veins present between R_1 and R_{2+3} in forewing and two in hindwing. Macrotrichiae following course of veins very dense.

Terminalia (figs. 85, 86) rather small. Submedian cleft of tenth tergite slanting basad toward left and meeting basal margin, narrow

basally but gradually divergent apically. Left hemitergite (10 L) darkly pigmented, quadrate; produced caudad as a broad, twisted process (10 LP) curled ventrad along outer apical margin. Right hemitergite (10 R) large equilaterally triangulate, weakly pigmented, especially along inner margin, which is deeply excised behind middle; process (10 RP) arcuate on inner and apical margin, produced as a short claw not extending far to right of outer margin of process. A narrow, darkly pigmented appendix, present in membrane of median cleft, is feebly connected basally and apically with 10 R.⁹ Ninth sternite (H) broad, developed as a broad, apically truncate process (HP) slanting to the right; right apical angle heavily sclerotized, microechinulate; left apical angle membranous. Composite left cercus-basipodite and left paraproct (LCB+LPPT) triangular, sclerotic, isolated. Right paraproct obsolete. Left cercus two-segmented; basal segment (LC₁) emarginated on inner side, clavate apically and bearing about 15 echinulations along inner apex; terminal segment short, tapered terminally, broadly united with basal segment. Right cercus with basal segment somewhat laterally compressed; margins of basal foramen greatly elongated, darkly pigmented; terminal segment cylindrical, longer and narrower than that of left cercus.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56760.

Type data.—Finca Esperanza, Chiapas, Mexico, at light, in a coffee plantation in a virgin forest, August 3, 1935 (A. Dampf).

Paratypes.—Two males on slides with holotype data but collected on March 12, 1938. One deposited in the writer's collection, the other in that of Dr. Alfons Dampf.

Remarks.—This species, named for Dr. Alfons Dampf, of the Escuela Nacional de Ciencias Biológicas, Mexico City, can be distinguished at once from all the other known *Chelicercas* by its two-segmented left cercus.

Subgenus *CHELICERCA*, sensu stricto

CHELICERCA (CHELICERCA) DAVISI (Ross), new combination

Anisembia (Chelicerca) davisi Ross, 1940b, p. 656, figs. 26–28.

Holotype.—Winged male, on slide, U.S.N.M. No. 53979.

Type data.—Collected in gardenias from near El Fortín, Veracruz, Mexico, in plant quarantine at Brownsville, Tex., January 16, 1937.

CHELICERCA (CHELICERCA) NODULOSA, new species

FIGURES 84, 87, 88

Male (on slide).—Head, antennae, foretibiae, and terminalia medium brown; prothorax pale straw yellow; pterothorax, wings, legs,

⁹ This is probably homologous to the isolated, sclerotic, heavily pigmented sclerite found in this position in *davisi* and *nodulosa*.

and abdomen light brown. Length 6.5 mm.; forewing length 4.2 mm., breadth 1.1 mm.

Head (fig. 84) with eyes very large, strongly inflated; interspace slightly narrower than an eye width; sides behind eyes short, slightly shorter than an eye length, straight, strongly convergent, abruptly rounded behind; caudal margin transverse, weakly arcuate. Mandibles moderate sized, sharply pointed, inner sides evenly emarginated. Antennae strongly pigmented throughout.

Wings moderately broad, light brown; hyaline stripes narrow, sharply defined. Three cross veins present between R_1 and R_{2+3} in forewing and four in this position in hindwing. Anal vein well defined basally in both wings, united by a cross vein to Cu_{1b} .

Terminalia (figs. 87, 88) similar to those of *davisi* with the following differences: Median cleft of tenth tergite broader and with differences in margins; 10 LP narrower, more strongly tapered apically; 10 RP broader, with apical claw not extending beyond outer margin of process. Process of hypandrium (HP) broader; with left apical angle produced as a prominent, thumblike nodule, which is densely echinulate.

Female (in alcohol).—Head, mesothorax, hindlegs, and abdomen reddish brown; antennae and prothorax light brown. Body length 8.5 mm. Head circular in outline, without dorsal pattern. Eighth sternite uniformly pigmented throughout. Ninth sternite with an obtuse, membranous, mediobasal angle similar to *texana* (Ross, 1940b, fig. 38), but more extensive.

Holotype and allotype.—Male and female, respectively, on slides, U.S.N.M. No. 56046.

Type data.—Collected at Matamoros, Mexico, in plant quarantine in a cargo of pineapples shipped from Isla, Veracruz, Mexico, June 15, 1940, by Inspectors Anderson, Parnell, and Reagan.

Paratype.—Topotypic female, deposited in the writer's collection.

Remarks.—*C. (C.) nodulosa* is closely related to *davisi* from the same state of Mexico. It may be separated by its much larger, inflated eyes, evenly emarginated mandibles, paler wings with cross veins, and particularly by the presence of the prominent, echinulate nodule of the left apical angle of the hypandrium process (HP).

CHELICERCA (CHELICERCA) WHEELERI (Melander), new combination

FIGURES 89-91

Olymtha wheeleri MELANDER, 1902, p. 17, fig. 1.

Anisembia wheeleri (Melander) KRAUSS, 1911, p. 70.—CHAMBERLIN, 1923, p. 346.—DAVIS, 1940d, p. 532, figs. 15-18.

Huploembia wheeleri (Melander) ENDERLEIN, 1912, pp. 70, 109, fig. 41.

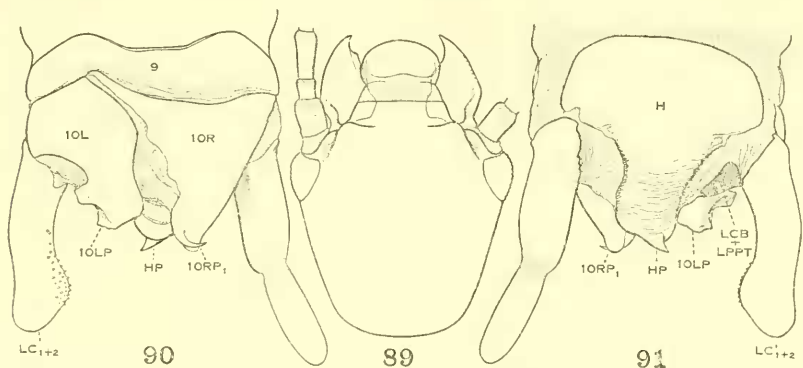
Anisembia (Chelicerca) wheeleri (Melander) ROSS, 1940b, p. 657, figs. 29, 30.

Holotype.—Apterous male, on slide, in Museum of Comparative Zoology (type No. 1638).

Type data.—Cuernavaca, Mexico, December 27, 1900 (W. M. Wheeler), collected while excavating a nest of *Leptogenys wheeleri* Forel.

This remarkable species is known only from the above type specimens. Since it was collected in the ground, it may be assumed that the species normally occurs under stones instead of in the bark of trees.

Previous descriptions (Melander; Davis) have been based on this specimen while preserved in alcohol. Since so many more details are visible in a properly cleared specimen the type has been treated in KOH and mounted on a slide. The writer is grateful to Prof. Nathan Banks for this privilege. The following brief redescription and the accompanying figures are based on the holotype mounted on a slide.



FIGURES 89-91.—*Chelicerca (Chelicerca) wheeleri* (Melander), holotype male (Mexico): 89, Head; 90, terminalia (dorsal); 91, terminalia (ventral). Explanation of symbols on p. 403.

Male (holotype, on slide).—Dark brown throughout, prothorax, legs, and terminalia somewhat darker, the head much darker; mandibles golden, apices mahogany brown. Length 8.75 mm. (after KOH treatment).

Head with outline as figured (fig. 89). Eyes small, facets without pigmented interspaces; occipital foramen equilaterally triangulate, sides slightly curved, anterior angle acute, slightly rounded; ventral bridge broad, as wide as foramen length; submentum nearly twice as wide as long, sides slightly curved, slightly sclerotized; mentum represented by a narrow sclerite, broadly divided medially; manibles without apical teeth, stout, left mandible with a flange behind apex which forms an obtuse tooth on inner mandibular margin, right mandible with inner margin evenly arcuate.

Thorax with mesothoracic and metathoracic scuta as in females of the order.¹⁰

Hind basitarsi with only a terminal sole-bladder; densely clothed with large plantar setae.

Terminalia nearly unicolorous, with structure as figured (figs. 90, 91). 10 LP strongly curved ventrad, yellowish distad; membrane of tenth tergal cleft "granular" in appearance medially, with only a faint thickening; an elongate sclerite, lying above hypandrium process (HP), is of undetermined homology, and may represent a terminal sclerotization of the ejaculation duct; 10 RP with a characteristic, yellowish "talon" crossing its rounded tip; HP sclerotized, without echinulations, with a marginal flange, apex produced as a conical point; left cercus (LC₁) with terminal lobe not distinctly submembranous; basal segment of right cercus with basal foramen complex, greatly produced ventrad, inner margin somewhat flattened and depressed basally.

C. wheeleri is not closely related to the other species of the subgenus *Chelicerca* seen by the writer (i. e., *davisi* and *nodulosa*). From the abundant distinctive features, the nature of the tip of 10 RP₁ and the apex of HP may be selected for the purpose of separating it from other species.

CHELICERCA (CHELICERCA) HEYMONSI (Enderlein), new combination

Oligotoma heymonsi ENDERLEIN, 1912, p. 114, figs. 74-76.

Anisembia (?) *heymonsi* (Enderlein) CHAMBERLIN, 1923, p. 346.

Anisembia heymonsi (Enderlein) DAVIS, 1940d, p. 532.

Anisembia (Chelicerca) heymonsi (Enderlein) ROSS, 1940b, p. 658, fig. 31.

Holotype.—Winged male in Berlin Zoologischen Museum.

Type data.—Sierra Mixteca (Oaxaca?), Mexico (C. A. Purpus).

Subgenus DACTYLOCERCA ROSS

Dactylocerca ROSS, 1940b, p. 659 (type: *Anisembia rubra* ROSS).

CHELICERCA (DACTYLOCERCA) RUBRA (ROSS), new combination

Anisembia (Dactylocerca) rubra ROSS, 1940b, p. 659, figs. 35-37.

Holotype.—Winged male, on slide (type No. 4931), and *allotype*, female, on slide (type No. 4932), California Academy of Sciences.

Type data.—Rosarito Beach, Baja California, Mexico, April 3-5, 1939 (Michener and Ross).

Distribution.—Northwestern Baja California, southern California, and southeastern Arizona. (See also p. 499.)

¹⁰ This appears to indicate that only apterous males may be expected in this species. As noted previously, when a species has both winged and wingless males [e. g., *Anisembia texana* (Melander)], the latter have rudimentary wing pads on the posterior angles of the scuta.

Family OLIGEMBIIDAE

Oligembiidae DAVIS, 1940e, p. 536; 1940f, p. 680; 1942, p. 116.

American Embioptera. The males with mandibles dentate apically; R_{4+5} forked in both wings, M and Cu_{1a} simple, all the above veins sub-obsolete, represented only by rows of macrotrichiae and intervenal hyaline stripes; tenth tergite not completely cleft to base (except in *Idioembia*); left cercus two-segmented, the basal segment without echinulations. Hind basitarsi with only one bladder.

Type genus.—*Oligembia* Davis.

Distribution.—Warm-temperate and tropical America.

Three genera are included in this family—*Oligembia* Davis, well known by virtue of its many species; the new genus *Idioembia*; and, tentatively, the poorly known genus *Diradius* Friederichs, based upon an inadequately described unique specimen.

KEY TO GENERA OF OLIGEMBIIDAE (MALES)

1. Left cercus-basipodite (LCB) not fused to left cercus; right process (10 RP_1) blunt distad..... *Diradius*
Left cercus-basipodite fused to basal segment of left cercus; right process sharply pointed distad..... 2
2. Right tergal process separated at base from tenth tergite by a clearly defined, complete, transverse suture; tenth tergite not longitudinally cleft. *Oligembia*
Right tergal process continuous with tenth tergite, without a complete transverse basal suture; tenth tergite narrowly, longitudinally cleft. *Idioembia*

IDIOEMBIA, new genus

Males.—Characters similar to those of the following genus, *Oligembia*, but with the tenth tergite completely cleft to base, the suture very narrow, extending diagonally on right side of tergite. Right tergal process (10 RP_1) continuous with right hemitergite (10 R), without a complete, basal, transverse suture as in *Oligembia*.

Female.—Unknown.

Genotype.—*Oligembia banksi* Davis, by present designation.

The definite longitudinal suture of the tenth tergite of this genus is occasionally represented in the apparently more highly specialized genus *Oligembia* by a slight depression or groove in a similar position. The absence of the complete transverse basal suture of the right tergal process is the most useful distinguishing character.

IDIOEMBIA BANKSI (Davis), new combination

FIGURES 92-94

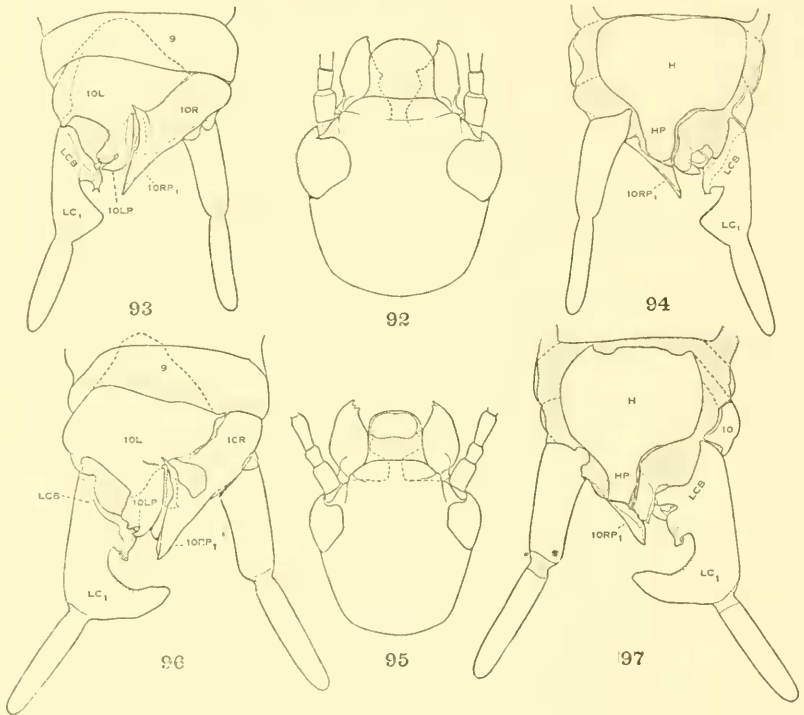
Oligembia banksi Davis, 1939b, p. 221, figs. 13-20.

Holotype.—Male, Museum of Comparative Zoology (No. 23721).

Type data.—Villa Rica, Paraguay (F. Shade).

Paratypes.—Males with type data; deposited in the Museum of Comparative Zoology, E. S. Ross collection, and the MacCleavey Museum, Sydney, Australia.

Through the kindness of Prof. Nathan Banks I have obtained a male paratype of this species mounted on a slide. After remounting the specimen certain noteworthy details became visible that were not noted in the original description or indicated in the figures. These, now revealed in the accompanying figures of this paratype, indicate that the species is not congeneric with species of the genus *Oligembia*.



FIGURES 92-94.—*Idioembia banksi* (Davis), paratype male (Paraguay): 92, Head; 93, terminalia (dorsal); 94, terminalia (ventral).

FIGURES 95-97.—*Idioembia producta*, new species, holotype male (southern Brazil): 95, Head; 96, terminalia (dorsal); 97, terminalia (ventral). Explanation of symbols on p. 403.

IDIOEMBIA PRODUCTA, new species

FIGURES 95-97

Male.—Color (in alcohol): Body and legs uniformly reddish brown, head black; antennae with basal segments 2 to 4 tan, otherwise brown. Length 6.8 mm.; forewing length 4.2 mm., breadth 1.0 mm.

Head (fig. 95) somewhat quadrate; eyes medium sized, moderately inflated, separated by interspace two and one-half eye widths wide;

sides behind eyes slightly more than one eye length long, gradually convergent; caudal margin abruptly, evenly rounded laterad, feebly arcuate medially. Occipital foramen elongate, rounded anteriorly; gular bridge as wide as submentum. Submentum small, narrow behind; sides divergent, arcuate; anterior margin transverse, anterior angles rounded.

Wings: Fork of Rs well within basal half in forewing, at basal third in hindwing; fork of R_{4+5} within basal half in forewing, at basal third in hind. About six $C-R_1$ cross veins and six R_1-R_{2+3} cross veins in forewing; cross veins absent elsewhere. Hyaline stripes narrow, sharply defined.

Terminalia (figs. 96, 97) with basal projection of tenth tergite acute, extending to base of eighth tergite; tenth tergite diagonally divided on right side to form two very unequal hemitergites (10 L and 10 R), the cleft narrow, irregular, somewhat sclerotized distad; left tergal process (10 LP) broad, inner margin produced caudad as a stout, feebly curved talon, outer margin straight, apical margin angulate; major right tergal process (10 RP_1) with outer side continuous with 10 R, inner base separated by a circular membranous area, inner apical angle sclerotic and sharply produced. Hypandrium (H) quadrate, sides rounded, gradually, broadly produced caudad; this process (HP) truncate apically, left margin sclerotic. Left paraproct (LPPT) subobsolete, represented by sclerotic margin of HP and a submembranous apical sclerotization. Left cercus-basipodite (LCB) continuous with left cercus, ventrally produced on margin as two irregular projections; developed mesad as a lobe, which is gradually narrowed dorsad and bifurcate. Left cercus with basal segment (LC_1) dark, cylindrical basally but gradually expanded distad and greatly produced inward as a pointed lobe almost as long as LC_1 . Terminal segment of left cercus elongate, cylindrical. Basal segment of right cercus, gradually broadened basad; foramen irregular; terminal segment similar to that of left cercus.

Female.—Unknown.

Holotype.—Male, on slide, U. S. N. M. No. 56582.

Type data.—Nova Teutonia, Santa Catharina, Brazil (F. Plaumann).

Paratypes.—Four males with type data, deposited in the California Academy of Sciences, the Museum of Comparative Zoology, and the writer's collection.

Remarks.—This distinct species is readily recognized by its greatly produced left cercus. The circular membranous area at the base of the right tergal process suggests that the completely severed process of *Oligembia* is attained by an extension of this area to the right lateral margin.

IDIOEMBIA ARGENTINA (Navás)

Embia (*Rhagadochir*) *argentina* NAVÁS, 1918, p. 104, fig. 4.*

Embia argentina NAVÁS, 1919, p. 25; 1923a, p. 197**; 1924a, p. 10***; 1930, p. 72 (records); 1933, p. 97.****

Pararhagadochir argentina (Navás) DAVIS, 1940a, p. 186, figs. 67-75 (misidentifications).

Holotype ?.—Male, Navás collection.

Type data.—Santa Fé, Argentina, January 6, 1916 (P. Mühn, S. J.).

Additional records.—Punta Lara, near La Plata, Argentina, October 5, 1914 (La Plata Mus.)*; Prov. de Buenos Aires, October 13, 1915 (C. Bruch) (La Plata Mus.)*; Chaco de Santa Fé, Las Garzas, Bords du Río Las Garzas, 25 km. west of Ocampo, Argentina, 1903 (E. R. Wagner) (Paris Mus.)***; Gran Chaco, Bords du Río Tapenaga, Colonie Florencia, Argentina, 1930 (E. R. Wagner) (Paris Mus.)***; Alta Gracia, Córdoba, Argentina, December 25, 1921 and February 3, 1922, at light (Bruch)**; Buenos Aires, Argentina, March 13, 1930.****

Navás had specimens from three Argentina localities before him at the time of the original description of this species. (See above records.) Those from Punta Lara and Buenos Aires were apparently returned to the La Plata Museum; the other, from Santa Fé, was a part of the Navás collection. Although Davis (*l. c.*) has arbitrarily regarded the specimen from Punta Lara as the holotype, this does not appear to be the case. Dr. Biraben, of the La Plata Museum, has informed me, in a letter, that no specimen labeled as the type of *argentina* is deposited there; furthermore, it is evident that Navás's figures (fig. 4), with which his description agrees, were made from a specimen in his own collection (see "Col. m.", in the caption). No doubt this was the Santa Fé specimen. The writer thus feels it safe to conclude that the Santa Fé specimen should be regarded as the holotype.

Davis (*l. c.*) studied two males in the Paris Museum from Chaco de Santa Fé, Argentina, identified as *argentina* by Navás (1924a), and on the basis of these specimens he assigned the species to the genus *Pararhagadochir*. However, a careful examination of Navás's original description and figures indicates that these specimens were incorrectly identified by Navás and that *argentina* is in reality a member of the genus *Idioembia* and is, perhaps, closely related to the *I. producta* described above. The reasons for the present generic assignment are as follows:

1. Navás's figures and description of the wings of *argentina* correspond very well to *I. producta* and not to any known species of *Pararhagadochir*. His figures of the wings of *trachelia* and *birabeni*,

in the same paper, show that he was careful in his delineation of the cross veins characteristic of species of *Pararhagochir* and thus probably would have indicated such had they been present in his type.

2. His figures and descriptions of LC_1 ("cerco sinistro articulo primo apice in lobum internum grandem longumque subcylindricum dilatato") and of $10 RP_1$ ("dextro in dentem longum triangularem styli-formem, apice bidentatum producto") are likewise descriptive of *producta*. The fact that no echinulations were mentioned as being on the lobe of LC_1 is also significant.

3. The measurements of the described specimen (length 5 mm., forewing length 4.8 mm., hindwing 4.0 mm.) are much less than those of the specimens of *Pararhagochir* that have been erroneously assigned to the species.

Any other determinations of this species by Navás, even those of specimens at hand at the time of the description, are not to be trusted, as his specimens were uncleaned and thus did not fully exhibit the characters. There is a great need for a careful redescription of the holotype in order to confirm the present generic assignment and to determine its relationship to the other species of *Idioembia*.

Genus OLIGEMBIJA Davis

Oligembia DAVIS, 1939b, p. 217.—ROSS, 1940b, p. 636.—DAVIS, 1942, p. 117.

At the time of the description of this genus only two component species, *hubbardi* (Hagen) and *oligotomoides* (Enderlein), were previously known, both of which had been erroneously placed generically. Davis's contributions (1939b, 1942) and that of the writer (1940b) have brought to light four additional new species. In the material now at hand 17 more have been discovered, bringing the total number of species to 23 and thus making *Oligembia* the largest American genus of the order, with potentialities of a still much greater increase in size.

A study of this lot of species, of which only three have not been seen by the writer (*oligotomoides*, *intricata*, and *rossi*), makes possible a more substantial evaluation of generic characters. The genus is accordingly redescribed as follows:

Males.—Alate, size generally small, usually pale in color. Head with eyes generally large and composed of large facets; mandibles small, with three apical dentations on left mandible and two on the right, apices often curved ventrad; mentum obsolete; submentum sclerotic, prominent, shieldlike, variable in shape. Wings usually pale; R_{4+5} forked; this, M, and Cu_{1a} represented only by rows of macrotrichiae; hyaline stripes broad. Hind basitarsus with only one sole-bladder; this, the terminal one, is very small, subobsolete. Terminalia

with tenth tergite (10) generally extensively produced forward beneath ninth tergite (9), uncleft basally, forming an uninterrupted tergal plate; left tergal process (10 LP) continuous with tergite, broad, complex apically; right process (10 RP₁) large, cultriform, separated from tergite at base by a thin, complete, transverse suture; bearing a short, narrow appendix (10 RP₂) at inner base. Right paraproct obsolete. Left paraproct (LPPT) present, fused along inner side with side of process of ninth sternite (HP). Left cercus-basipodite (LCB) well developed, complex, often sclerotic, bearing one or two inner lobes, one of which is usually minutely bifid terminally. Basal segment of left cercus nonechinulate, fused basally to LCB, sometimes deeply excised on inner side and apically clavate, or cylindrical. Right cercus with basal segment usually cylindrical but at times emarginated and sclerotic on inner side.

Females.—Very few species having female specimens associated with males are available in collections. All females so far known have only one hind basitarsal sole-bladder. Although it is very doubtful whether any facts of systematic importance can be gained by a study of the females, it is possible that their identification may be possible on the basis of color, size, head form, chaetotaxy of hind-tarsus, and pigmentation of the eighth and ninth sternites of the abdomen.

Genotype.—*Oligotoma hubbardi* Hagen, by original designation.

Distribution.—Warm-temperate and tropical America.

Habitat.—In bark of trees, at bases of epiphytes and saprophytes growing on trees. See notes concerning *melanura*, *lobata*, and *vandykei*.

Remarks.—The species of *Oligembia* compose a very natural and distinct genus, but they must often be separated by detailed characters of the terminalia which are difficult to clearly express in keys. The student will find such evidence as geographic distribution, combined with a comparison of the male terminalia with the published figures of each species, the simplest means of making determinations. The few and scattered records of species indicate that more thorough collecting should bring to light many additional new species.

The present study of the greatly increased number of known species of *Oligembia* reveals that at least two major groups of species are recognizable. These are at this time defined as subgenera. One species, however, *Oligembia rossi* Davis, of Panama, appears to possess such unusual characters that it is only tentatively assigned to the first subgenus on the basis of the left cercus-basipodite structure. Its tergal processes are unlike any other known species of the genus. *Oligembia oligotomoides* (Enderlein) appears to be a member of the

second subgenus, but it is so incompletely described, and without a definite type locality, that it cannot be distinguished without a re-description of the type.

Subgenus OLIGEMBIA, *sensu stricto*

Males.—Tips of mandibles usually curved ventrad; teeth small, blunt, inconspicuous. Terminalia with tenth tergite apodeme often not strongly produced forward beneath ninth tergite, usually broadly rounded; left tergal process (10 LP) elongate, apex stout, complex, inner margin (except in *melanura*) not developed as a "talon"; right tergal process (10 RP₁) with outer margin nearly straight, evenly slanted from base to apex; left paraproct (LPPT) narrow, greatly produced caudad, tip usually attaining that of 10 RP₁ in length; left cercus-basipodite (LCB) with only a single inner lobe, variable in development, generally with a pair of terminal "claws," occasionally simple; basal segment of left cercus (LC₁) seldom clavate, that of right cercus (RC₁) never lobed.

Type.—*Oligotoma hubbardi* Hagen.

Distribution.—That of the genus *Oligembia*.

This subgenus can be separated from the other subgenera principally on the basis of the great length of the left paraproct, the structure of the left tergal process, and the structure of the left cercus-basipodite. A great variety of structure in terminalia is exhibited by the 10 included species. One of these, *armata*, is so strikingly extreme in characters that it warrants a position in a separate group from the others. The subgenus is accordingly divided into 2 species groups in the following key:

KEY TO GROUPS AND SPECIES OF OLIGEMBIA (*s. str.*) (MALES)

1. Right tergal process (10 RP₁) with a prominent, domelike, densely echinulate nodule at inner base (Group II)..... *armata*
Right tergal process not as above (Group I)..... 2
2. Left tergal process (10 LP) with a narrow, longitudinal cleft, extending to within basal half of process; inner portion sclerotic, outer portion submembranous; Panama..... *rossi*
Left tergal process not as above, outer portion nearly as sclerotic as inner... 3
3. Color pale, usually tan; head light ferruginous..... 4
Color dark brown or blackish; head nearly black..... 7
4. Left cercus-basipodite (LCB) with inner lobe free, projecting mesad..... 5
Left cercus basipodite with inner lobe appressed to inner side of left cercus or obsolete..... 6
5. Left tergal process with a subapical notch on left side (fig. 101): "claws" of left cercus-basipodite directed inward and upward; Virgin Islands..... *brevicauda*
Left tergal process with left side simple, unnotched (fig. 99); "claws" of LCB directed upward and curved back toward left cercus; Florida.... *hubbardi*

6. Head elongate, narrow, distance from eye to posterior margin more than one eye length; Central America----- **buscki**
 Head broad, circular, distance from eye to posterior margin less than one eye length; Peru----- **peruviana**
7. LCB with inner lobe simple, sclerotic, sharply pointed, caudally curved; 10 LP with a stout inner "talon" abruptly curved transversely across apex; Texas----- **melanura**
 LCB with inner lobe complex, usually stout with terminal clawlike processes; 10 LP not as above----- 8
8. 10 RP₁ with inner basal angle produced upward as a small, but prominent, non-echinulate lobe; 10 LP with inner apical angle strongly lobed; Dominican Republic----- **darlingtoni**
 10 RP₁ and 10 LP not as above----- 9
9. Pronotum light reddish brown, much paler than head and pterothorax; southern Brazil----- **bicolor**
 Pronotum, head, and pterothorax unicolorous dark brown; southern Brazil----- **unicolor**

GROUP I

OLIGEMBIA (OLIGEMBIA) HUBBARDI (Hagen)

FIGURES 98-100

Oligotoma hubbardi HAGEN, 1885, p. 142.—SCHWARZ, 1888, p. 94 (biology).—KRAUSS, 1911, p. 44.—ENDERLEIN, 1912, p. 91.

Embia (Oligotoma) hubbardi (Hagen) MELANDER, 1902, p. 21.

Oligembia hubbardi (Hagen) DAVIS, 1939b, p. 218, figs. 1-5.—ROSS, 1940b, p. 637, figs. 5-7.

Holotype.—Male, on slide, deposited in Museum of Comparative Zoology (type No. 153).

Type data.—Enterprise, Fla., May 24 (H. G. Hubbard).

Davis plesiotype.—Male, on slide, Royal Palm Park, Fla., March (W. S. Blatchley) (MCZ).

Ross plesiotype.—Male, on slide, St. Petersburg, Fla. (USNM).

Additional record.—Paradise Key, Fla., March 4, 1919 (H. S. Barber) (USNM), males and immature specimens.

Remarks.—Recently, through the kindness of Prof. Nathan Banks, the writer was permitted to treat Hagen's fragmentary type in KOH and to mount the parts in balsam for greater permanency and ease of examination. The accompanying figures of the head and of the terminalia are made from the type. Recent redescriptions of the species (Davis; Ross) appear to have been made from correctly identified specimens.

The terminalia, as noted by Davis, are in very poor condition, but the all-important processes (10 LP, 10 RP₁, and LCB) are present. In the course of preparing the terminalia it was noted that the terminal tarsal segment of some insect, probably the type itself, was lodged in the tenth tergal cleft with its claws overlapping the tip of

10 RP₁. This explains the statements made by Davis (1939b) concerning the presence of clawlike structures on this process (also see Ross, 1940b).

OLIGEMBIA (OLIGEMBIA) BREVICAUDA Ross

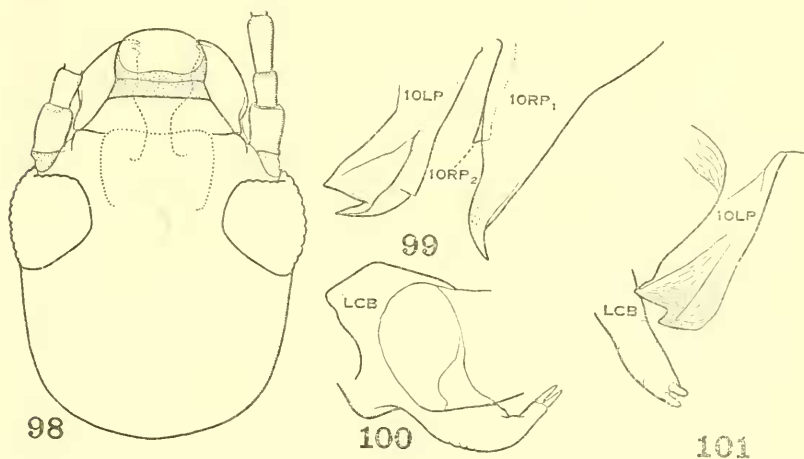
FIGURE 101

Oligembia brevicauda Ross, 1940b, p. 640, figs. 1, 8–10.

Holotype.—Male, U. S. N. M. No. 53980.

Type data.—St. Croix, Virgin Islands, June 20, 1939 (H. A. Beatty).

Remarks.—Recently an additional male specimen of this species was studied by the writer in the United States National Museum collection. It is labeled “under rubbish,” Lower Love, St. Croix, Virgin Islands, August 1940 (H. A. Beatty). This specimen reveals a noteworthy intraspecific variation and the fact that 10 LP of the holotype specimen had been broken off midway in its length.



FIGURES 98–100.—*Oligembia hubbardi* (Hagen), holotype male (Florida): 98, Head; 99, processes of tenth tergite; 100, left cercus-basipodite (subventral aspect).

FIGURE 101.—*Oligembia brevicauda* Ross (Virgin Islands): Left tergal process and process of left cercus-basipodite. Explanation of symbols on p. 403.

The left tergal process, 10 LP (fig. 101), is not short as originally described but is actually similar to that of *hubbardi*. The mesal process of the left cercus basipodite terminates as a pair of stout “claws,” also as in *hubbardi*, whereas this process tapers to an irregular point in the holotype.

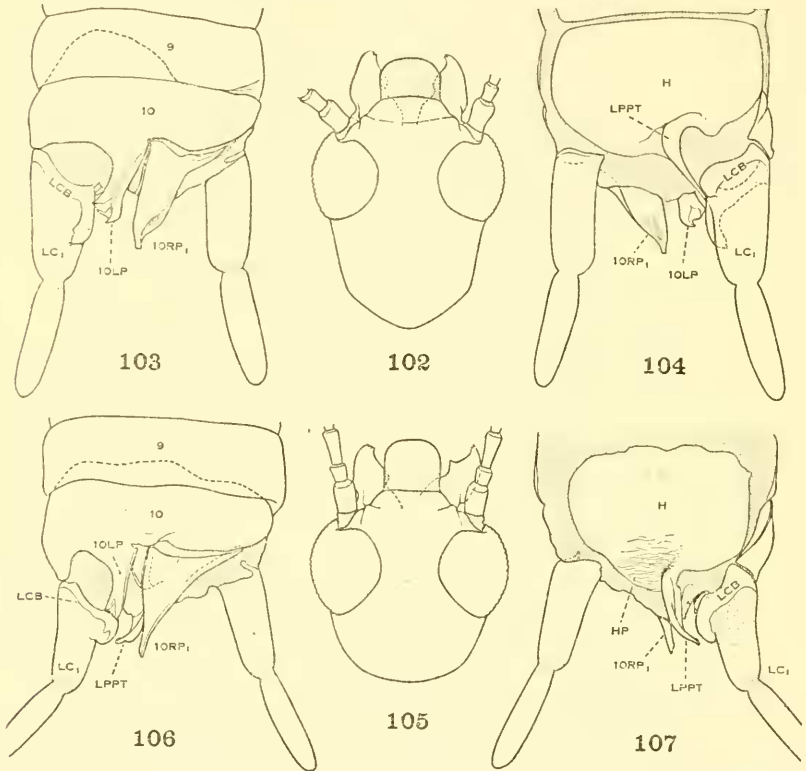
These findings give stronger evidence of the close relationship of *brevicauda* and *hubbardi*, although the two species are separable by means of numerous characters.

OLIGEMBIA (OLIGEMBIA) BUSCKI, new species

FIGURES 102-104

Male (on slide).—Head and antennae medium brown; processes of terminalia and mandibles straw yellow; body, legs, and wings light tan. Length 6 mm.; forewing length 4 mm., breadth 1 mm.

Head (fig. 102) with eyes and facets very large, inflated, separated



FIGURES 102-104.—*Oligembia buscki*, new species, holotype male (Panama): 102, Head; 103, terminalia (dorsal); 104, terminalia (ventral).

FIGURES 105-107.—*Oligembia peruviana*, new species, holotype male (Peru): 105, Head; 106, terminalia (dorsal); 107, terminalia (ventral). Explanation of symbols on p. 403.

by interspace equal to one eye width; sides behind eyes equal in length to the eyes, nearly straight, gradually convergent; caudal margin abruptly arcuate medially. Mandibles with apical teeth small, inconspicuous, curved downward, inner medial tooth of left mandible obtuse, that of right mandible rounded.

Wings pale, with hyaline lines, very broad, with marginal fringe long, otherwise without noteworthy specific features.

Terminalia (figs. 103, 104) with basal projection of tenth tergite short, rounded, extending halfway beneath ninth tergite, strongly transverse. Left tergal process (10 LP) sclerotic, parallel-sided, apically dilated; apical margin not cleft, with only a slight projection near inner angle. Right tergal process (10 RP₁) broad, not strongly convergent at basal third; apical third abruptly convergent, outer side rugose; apex with a small truncate projection curving outward; inner basal process (10 RP₂) with a long, narrow, sclerotic rod extending more than half length of 10 RP₁. Hypandrium (H) and process (HP) very weakly pigmented. Left paraproct (LPPT) narrow, shorter than 10 LP, hooked basally. Left cercus-basipodite (LCB) strongly sclerotized; inner projection curving caudad, lying close along inner side of basal segment of left cercus to the apical third, apex bearing a single spine. Basal segment of left cercus (LC₁) simple, unlobed; it, as well as other parts of left cerci, pale, unpigmented. Right cercus with a small, outer, half-ring cercus-basipodite.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56052.

Type data.—Cabima, Panama, May 21, 1911 (August Busck).

Additional specimen examined.—One male, at light, Cacao, Trece Aguas, Alta Vera Paz, Guatemala, March 30, 1906 (Schwarz and Barber) (USNM).

The additional specimen may prove to represent a distinct species. The head appears to be broader (somewhat crushed) it has two claws at tip of LCB instead of one; 10 LP has a much simpler appearing apex, much like that of *hubbardi*. The last-mentioned difference may be due to the angle of view as this process is somewhat curved downward in the holotype specimen.

The species is named after August Busck, of the United States Bureau of Entomology and Plant Quarantine.

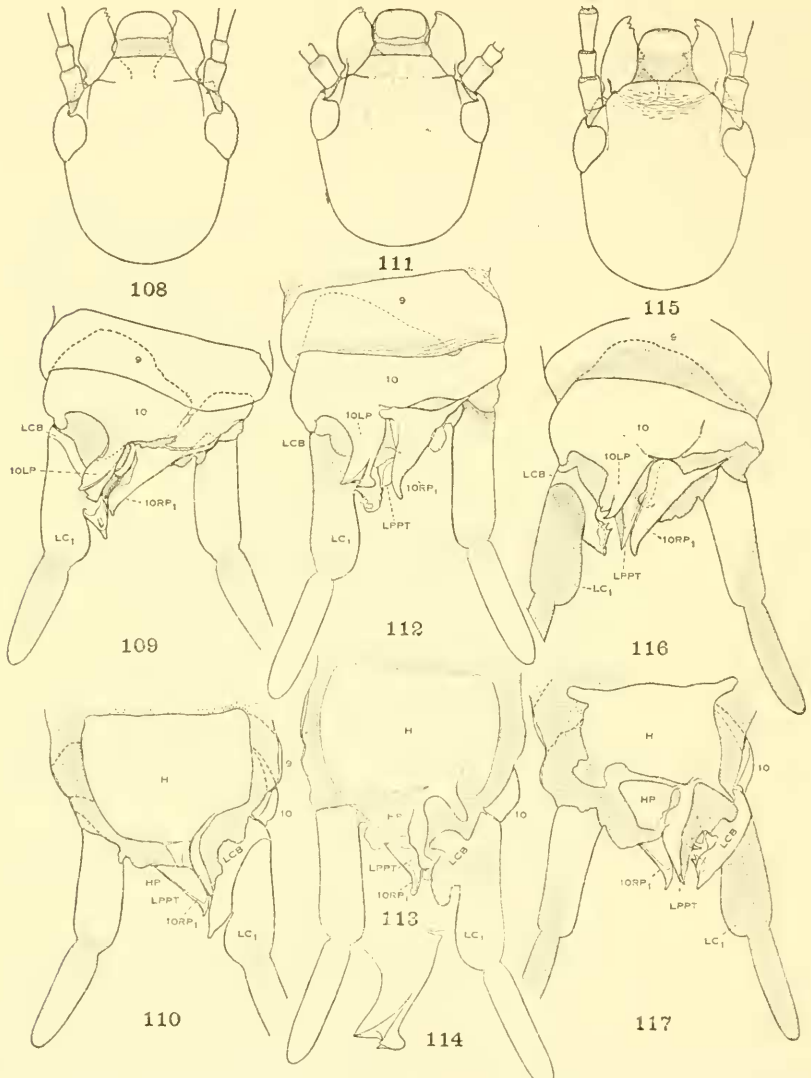
OLIGEMBIA (OLIGEMBIA) PERUVIANA, new species

FIGURES 105-107

Male.—Color (on slide): Body, legs, and wings very pale straw yellow; head and antennae light brown, mandibles and submentum reddish brown. Length 5.5 mm.; forewing length 3.9 mm., breadth 1 mm.

Head (fig. 105) with eyes very large, inflated, facets prominent; eyes separated by space less than an eye width wide. Sides behind eyes very short, continuous with the evenly arcuate caudal margin. Left mandible with apical dentations blunt, curved ventrad; dentations of right mandible blunt but not curved ventrad.

Wings very pale, R_1 paralleling costal margin and nearly attaining it apically; radial sector forked just within basal half of fore-



FIGURES 108-110.—*Oligembia bicolor*, new species, holotype male (southern Brazil): 108, Head; 109, terminalia (dorsal); 110, terminalia (ventral).

FIGURES 111-114.—*Oligembia darlingtoni*, new species, holotype male (Dominican Republic): 111, Head; 112, terminalia (dorsal); 113, terminalia (ventral); 114, detail of 10 LP.

FIGURES 115-117.—*Oligembia unicolor*, new species, holotype male (southern Brazil): 115, Head; 116, terminalia (dorsal); 117, terminalia (ventral). Explanation of symbols on p. 403.

wing, at basal third in hindwing; R_{4+5} forked at basal third in both wings; hyaline lines broadest in forepart of wing, not clearly defined.

Terminalia (figs. 106, 107) with tenth tergite extending basally only one-third beneath ninth tergite; not acutely produced basally. Left tergal process (10 LP) narrow, parallel-sided, nearly straight, only slightly projected to the left; apex scarcely expanded, rather simple, thickened, acutely, symmetrically cleft dorsally, subtended by irregular broad lobe. Right tergal process (10 RP_1) broad basally, abruptly narrowed apically, thence parallel-sided and sclerotic; tip acutely pointed. Inner flaplike process (10 RP_2) lying partially beneath base of 10 RP_1 , with a sclerotic rod submedially. Process of hypandrium (HP) and left paraproct (LPPT) fused, the latter developed caudad as a long dorsally curving process equal in length to 10 RP_1 . Left cercus basipodite (LCB) an irregular sclerotic ring, produced inward along base of left cercus as a blunt lobe, not bearing processes or clawlike hooks. Right cercus-basipodite present as a narrow, incomplete sclerotic ring on outer side of base of right cercus. Cerci pale, membranous.

Female.—No specimens available.

Holotype.—Male, on slide, U.S.N.M. No. 56053.

Type data.—Iquitos, Peru, March-April 1931 (R. C. Shannon).

Remarks.—An additional specimen in the United States National Museum, badly damaged, also with the above data, is probably this species. It differs from the holotype in having 10 LP formed much as in *hubbardi* and *brevicauda* (that of the holotype may be broken) but with a stouter inner projection on its apical margin; 10 RP_1 has a sinuous outer margin and is more fleshy (this may be anomalous); LCB has a well-developed process suggestive of *buscki* with two "claws" (the condition in the holotype may be anomalous). In spite of this variation, the species is recognizable by its short, circular head with large eyes.

OLIGEMBIA (OLIGEMBIA) DARLINGTONI, new species

FIGURES 111-114

Male (holotype on slide).—Head dark brown, becoming more golden anteriorly; antennae brown; mandibles golden brown; submentum reddish brown; prothorax pale, tan; pterothorax, legs, wings, and abdomen light brown; terminalia largely dark brown, cerci pale. Length 6.6 mm.; forewing length 5.0 mm., breadth 1.25 mm.

Head (fig. 111) with form as illustrated; eyes with interspaces of facets slightly pigmented; occipital foramen rounded anteriorly; submentum outline indicated by dotted line in figure.

Body and legs with all hairs noticeably long. Wings as throughout the genus but with marginal fringe exceptionally long, especially toward base.

Terminalia (figs. 112-114) with basal apodeme of tenth tergite (10) acute, extended on right side beneath almost entire ninth tergite (9); left tergal process (10 LP) (fig. 114) broadly attached basally, very gradually narrowed distad, somewhat parallel-sided, inner apical angle abruptly expanded, acutely rounded, deeply, divergently furrowed dorsally, apex of process complex and thick (dorsoventrally); right tergal process (10 RP₁) with a prominent, vertical, naked nodule at inner basal angle, surface of 10 RP₂ sparsely echinulate, entire process somewhat swollen and (before preparation) strongly curved ventrad, apex sclerotic, golden, curled downward at tip, pointed. Hypandrium (H) weakly sclerotized, its process (HP) especially so, nearly membranous across base, subobsolete; left apical angle stronger, with a fingerlike projection pointed toward LCB. LPPT fused to H basally, elongate, greatly twisted distad. Left cercus-basipodite (LCB) sclerotic, with a single wrinkled, fingerlike, inner projection pointed dorsad, this terminating in a pair of claws; ventral margin with an acute, sclerotic lobe (probably homologous to that of *Dilobocerca*) covered with minute echinulations. Basal segment of left cercus (LC₁) submembranous except along inner margin, apex swollen; basal segment of right cercus cylindrical, well sclerotized, basal foramen slightly irregular and more heavily sclerotized; terminal segments of both cerci normal, similar. Both cerci are longer than those of most species.

Female.—Unknown.

Holotype.—Male, on slide, deposited in the Museum of Comparative Zoology, from Valle Nueva, near Constanza, Dominican Republic, 7,000 feet, August 1938 (P. J. Darlington) (MCZ).

Remarks.—This species, which can be separated at once from all known species by the peculiar shape of the left tergal process (10 LP), is named for the collector.

OLIGEMBIA (OLIGEMBIA) BICOLOR, new species

FIGURES 108-110

Male.—Color (in alcohol): Head black; pterothorax, foretibiae, mid and hind femora, and abdomen mahogany brown; prothorax and remainder of forelegs yellowish orange; basal half of antennae, midtibiae and hindtibiae, tarsi, and terminal segments of cerci straw yellow. Length 5.1 mm.; forewing length 3.0 mm., breadth 0.9 mm.

Head (fig. 108) circular, almost as broad as long; eyes small, separ-

ated by an interspace two and one-half eye widths wide; sides slightly arcuate and gradually convergent, posterior margin evenly rounded; submentum very large, dark, sides arcuate, abruptly so mesad, anterior margin broader than posterior, shallowly incurved. Mandibles with the basal tooth, of the three apical dentations, of the right mandible, larger; left mandible with the two apical teeth close together; both mandibles with medial angles rounded, strongly constricted behind middle.

Wings without specific peculiarities; fringe as in *darlingtoni*.

Terminalia (figs. 109, 110) with tenth tergite (10) very short, transverse; basal projection short, broadly rounded, extending just beyond middle of 9, reduced on right side and notched to right of middle. Left process (10 LP) constricted basad, expanded distad, outer side arcuate; apical margin shallowly, broadly emarginated; dorsal surface with a fine, diagonal carina extending from outer apical angle toward base of inner margin. Right process (10 RP₁) reduced, inner margin membranous, apex curved caudad and with a minute bulbous tip. Secondary process (10RP₂) dark, sclerotic. Hypandrium (H) pigmented throughout; its process (HP) small, strongly narrowed caudad, semidetached basally. Left paraproct (LPPT) fused on inner basal side to HP, very narrow, elongate, tip almost attaining that of 10 RP₁. Left cercus-basipodite (LCB) a dark sclerotic ring fused to LC₁, with two projections in outline of ventral margin; produced mesocaudad as a conical lobe. Basal segment of left cercus (LC₁) robust, immediately swollen behind LCB on inner side. Basal segment of right cercus cylindrical, not apically swollen, margin of foramen irregular. Terminal segments of both cerci similar, tapered distally, almost unpigmented.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56584.

Type data.—Nova Teutonia, Santa Catharina, Brazil (F. Plau-mann).

Paratypes.—Several males with above data deposited in the California Academy of Sciences, the Museum of Comparative Zoology, and the writer's collection.

OLIGEMBIA (OLIGEMBIA) UNICOLOR, new species

FIGURES 115-117

Male (in alcohol).—Mahogany brown throughout, abdomen somewhat lighter, head darker; antennae with two basal segments brown, six succeeding segments light yellow, remainder medium brown; cerci with terminal segments pale. Length 5.0 mm.; forewing length 3.2 mm., breadth 0.9 mm.

Head (fig. 115) elongate, narrow; eyes rather small, slightly inflated, facets large and outlined by pigmented interspaces; eye interspace equal to two and one-half eye widths; sides behind eyes two eye lengths long, nearly straight, scarcely convergent caudad; posterior margin broadly rounded; frontal region transversely rugose; occipital foramen small, narrowly rounded anteriorly. Submentum small, quadrate; sides slightly arcuate, gradually divergent from base; anterior angles rounded; anterior margin feebly arcuate. Mandibles with very broad bases, strongly narrowed distad; apical teeth short, broad, well defined; medial angles very sharp, prominent; inner margins of base greatly developed mesad, rounded.

Wings without notable features except hyaline stripes in hindwing are very broad and diffused, much more so than in forewing.

Terminalia (figs. 116, 117) with tenth tergite (10) transverse; basal projection broadly rounded, extending only halfway beneath ninth tergite; left tergal process (10 LP) very broad basally, gradually narrowed but still broad, distad, inner "talon" very feeble and short, outer portion angulate on apical margin; major right process (10 RP₁) with inner basal angle developed as a smooth broad dome, extreme apex evenly curved outward. Hypandrium (H) quadrate, each corner produced as a narrow, truncate projection; process (HP) separated from H by a narrow, transverse slit, broad basad, gradually narrowed and losing pigment distad. Left paraproct (LPPT) fused to H at base, very narrow; apex attaining that of 10 RP₁, very strongly acuminate. Left cercus-basipodite (LCB) a heavily sclerotized ring; inner projection sclerotic, with a dorsal pair of short serrations. Basal segment of left cercus (LC₁) slightly expanded distad, entirely unpigmented. Basal segment of right cercus cylindrical, slightly broadened basad, foramen with angular dorsal and ventral projections on margin; outer apical angle membranous. Terminal segments of both cerci entirely unpigmented.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56583.

Type data.—Nova Teutonia, Santa Catharina, Brazil (F. Plau-mann).

Paratypes.—Several males with above data deposited in the California Academy of Sciences, the Museum of Comparative Zoology, and the writer's collection.

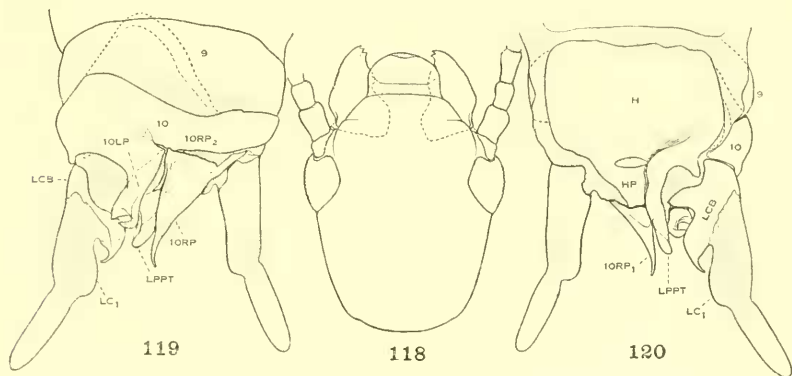
OLIGEMBI (OLIGEMBI) MELANURA, new species

FIGURES 118-120

Male.—Color (in alcohol): Sclerites very dark chocolate brown; intersclerotol membranes reddish brown. Head with clypeal region,

mandibles, and submentum reddish brown; antennae with basal two segments black, segments 3 and 4 yellowish brown, segments 5 and 6 darker, remainder dark brown. Abdominal terminalia with tenth tergite nearly black; tips of processes amber yellow.¹¹ Body length 5 mm.; forewing length 3.5 mm., breadth 0.8 mm.

Head (fig. 118) elongate; eyes rather small, slightly inflated, facets outlined by pigmented interspaces; distance between eyes equal to three eye widths; sides behind eyes two eye lengths long, slightly curved, gradually convergent; posterior margin arcuate. Occipital foramen as long as wide, evenly rounded anteriorly. Gular bridge extensive, one and one-half submentum lengths wide. Submentum quadrate, somewhat narrowed anteriorly; sides unevenly arcuate, corners rounded; anterior margin shallowly emarginated. Mandibles slightly curved ventrad at tips; apical teeth small.



FIGURES 118-120.—*Oligembia melanura*, new species, holotype male (Texas): 118, Head; 119, terminalia (dorsal); 120, terminalia (ventral). Explanation of symbols on p. 403.

Wings dark, interveinal hyaline stripes sharply defined. R_1 united at apex by a cross vein to R_{2+3} ; bordered throughout its length by reddish, granular lines. R_{2+3} represented by a pigmented vein; forked at basal third in forewing, at the basal fourth in hind; R_{4+5} forked medially.

Terminalia (figs. 119, 120) with tenth tergite (10) very dark, acutely angulate basally, produced forward beneath apex of eighth tergite; left process (10 LP) well developed, inner margin sinuous; apex deeply excised with a sharp left apical projection and a stout, irregular hook on right side, abruptly curved toward left; right process (10 RP_1) with inner margin nearly straight, outer margin gradually slanted mesad forming a very acute, sclerotic sharp point apically

¹¹ Some of the paratypes are entirely dark brown, with no part of the body or its appendages otherwise pigmented.

which curves slightly outward and ventrad at extreme tip; a small, narrow, subventral, inner process (10 RP₂) extends nearly halfway down the inner side of 10 RP₁. Ninth sternite (H) well pigmented, transverse; process (HP) narrow, truncate apically, narrowly united to H at outer third, separated from H mesad by a narrow, transverse membranous area. Left paraproct (LPPT) prominent, fused along entire inner side with H and HP; outer side produced at base as a narrow, fingerlike process projecting laterocaudad; apex produced caudad and nearly attaining tip of 10 RP₁. Left cercus-basipodite (LCB) strongly developed, more broadly sclerotic beneath, produced mesad as a broad, acute sclerite, and mesocaudad as a broad lobe, which is abruptly acuminate and sclerotic at apex—this tip minutely truncate and nonfurcate. Right cercus-basipodite obsolete. Left cercus (LC₁) membranous except on inner apical third, constricted basally; terminal segment cylindrical, similar to that of right cercus. Right cercus with basal segment gradually expanded toward base; basal foramen biemarginated dorsally, broadly and acutely produced ventrally.

Female (in alcohol).—Pigmented areas reddish brown on a golden yellow integument; head more reddish; tip of abdomen darker brown, venter yellowish. Length 6.5 mm.

Head relatively small, subcircular, characteristic basal pattern present; occipital foramen longer than broad, evenly arcuate anteriorly; gular bridge narrow. Mandibles with teeth large, acutely pointed. Antennae with basal segments lighter in color.

Hind basitarsi with only one sole-bladder; ventral setae large, irregular in size, sparse.

Abdominal sternites pale except seventh, eighth, and ninth: seventh with a small, circular pigmented area on each side, otherwise pale, membranous; eighth with pigmented areas covering entire lateral fourth, somewhat broadened caudad, membranous medially; ninth transverse, pale, but pigmented throughout except for a transverse, rectangular basal area.

Holotype, male (on slide), and *allotype*, female (on slide).—U. S. N. M. No. 56587, collected by the writer at New Braunfels, Tex., August 20, 1942. (See also p. 499.)

Paratypes.—Numerous topotype males and females with above data to be deposited in several major entomological collections.

Remarks.—*Oligembia melanura* is distinctly arboreal. Its preferred habitat appears to be the bark of trees sufficiently rough, or covered with moss and lichens, and protected from the sun to afford a moist, secluded environment. The type series was collected on trees growing on the shaded side of a narrow, rocky canyon cutting a

cedar-covered, limestone plateau. A number of species of trees present (*Sabina sabinoides*, *Quercus* spp., *Ulmus crassifolia*, etc.) harbored colonies of the insect. One old oak stump 15 feet high, with loose, deeply grooved bark, was found so thickly populated by the species that it glistened white with an almost continuous covering of silk. In general, however, the species seems to establish isolated colonies here and there on the trunk which are occupied by a single female and its brood of young. The species probably has an extensive range throughout much of the cedar-oak as well as in the post-oak associations of the region. It has not yet been found in the adjacent, mesquite-covered lowlands in spite of a careful search.

The food appears to be the lichens and moss through which the tunnels are spun. This is evidenced by the green color of the fecal pellets. The tunnels ramifying on the outer surface of the bark lead to a more protected retreat such as a crack in the bark or one between exfoliating bark flakes. Here the female constructs a larger, more densely spun tunnel, covered with feces, in which the eggs are laid.

As far as could be ascertained during the limited period of observation, the males and females are all in their penultimate instar late in July and early August and mature by the middle of August. The sex ratio seems to be 1:1. The eggs are laid during the remainder of August and early in September. Development probably begins during fall, and a considerable time may be spent in hibernation.

Anisembia texana (Melander) was found at times sharing the habitat of *melanura* but appeared to require the greater protection of loose, dead bark under which it could spin its tunnels. At the time *melanura* was maturing, *texana* had already mated, the males had died, and the young were in the first or second instars. Of the two species, *melanura* was by far the more abundant.

The species of the genus *Oligembia* heretofore have been known only from single specimens or very limited series. The discovery of *melanura* in large numbers affords the opportunity to examine more closely certain features of the complex male abdominal terminalia. All drawings of the terminalia were made for systematic purposes and drawn from somewhat distorted KOH-treated specimens. The untreated terminalia of this species reveal that all processes are concentrated toward the left to give length to the abdomen and sclerotic support to the ejaculatory duct. The greatly produced left paraproct forms the immediate ventral support of the duct and appears to be itself supported by the mesal process of the left cercus-basipodite which curves directly upward between the tips of the two tergal processes (10 RP₁ and 10 LP), which curve downward and apparently function

as hooks to insure the period of sexual union. The secondary right tergal process (10 RP₂) forms a dorsal flap over the anal opening and the process of the ninth sternite (HP) a ventral support of the anus.

An examination of the terminalia of a penultimate instar male just before the last ecdysis reveals the inner lobe of the structure, here regarded as the left cercus-basipodite, clearly forming within the cuticle of the left cercus. It is thus likely that much of this structure is derived directly from the basal segment of the left cercus. Perhaps only a small fused basal part is actually of basipodital origin.

OLIGEMBIA (?OLIGEMBIA) ROSSI Davis

Oligembia rossi DAVIS, 1939b, p. 219, figs. 6-12.

Holotype.—Male, on two slides, British Museum of Natural History.

Type data.—Barro Colorado Island, Panama Canal Zone (W. M. Wheeler).

GROUP II

OLIGEMBIA (OLIGEMBIA) ARMATA, new species

FIGURES 121-126

Male (on slide).—Body, legs, and wings tan; head and mandibles reddish brown; submentum orange; antennae chocolate brown. Length 5.4 mm.; forewing length 3.5 mm., breadth 0.85 mm.

Head (fig. 121) with eyes large, inflated, strongly convex, facets very large; eyes separated by a space one-third wider than an eye width; sides behind eyes longer than an eye length, subparallel for a short distance, thence gradually rounded and convergent, joining the evenly arcuate caudal margin. Mandibles with apical dentations small, blunt. Gular bridge very broad, slightly longer than an eye width.

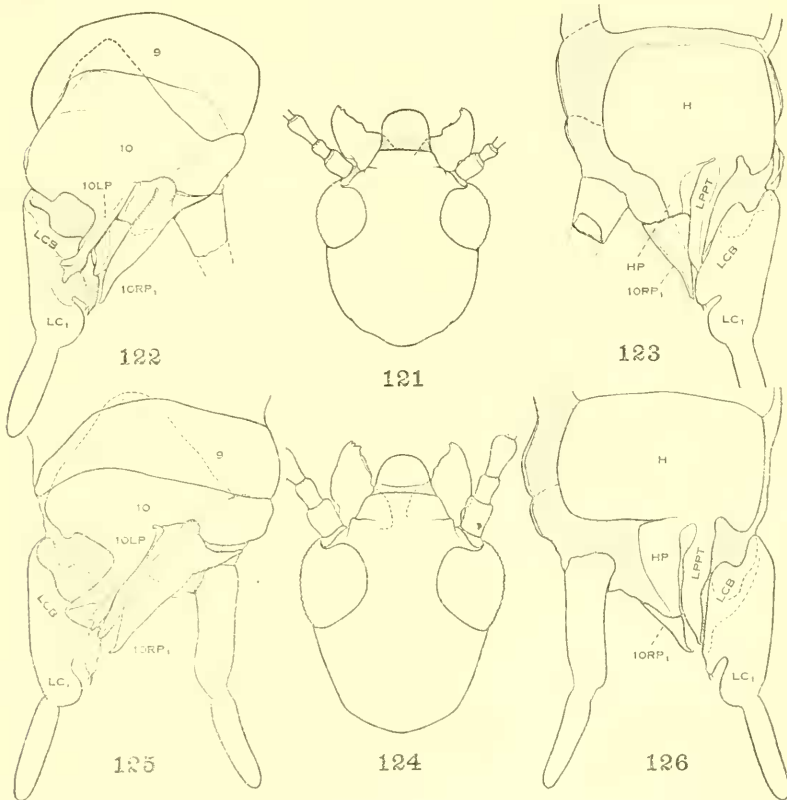
Wings similar to those of *peruviana*.

Terminalia (figs. 122, 123) with tenth tergite extensively produced forward beneath ninth tergite as an acute lobe nearly attaining basal margin of the ninth tergite. Left tergal process (10 LP) very long, sinuous, sclerotic, outer edge twisted downward, extending toward left at 45° and overlapping left cercus-basipodite; tip broadened, complex turned on edge (detail therefore not discernible from above). Right tergal process (10 RP₁) elongate, parallel to 10 LP and only slightly longer; tip curved caudad; bearing at inner basal margin a prominent, large, echinulate, rounded tubercle which is borne partially by the broadly sclerotized secondary right tergal process (10 RP₂). Left paraproct (LPPT) greatly developed caudally as an elongate sclerotized plate nearly as long as 10 RP₁, which is fused along inner basal half with the poorly developed process of the hypandrium (HP). Left cercus-basipodite (LCB) large, bearing a stout,

basally sclerotized lobe, which is microechinulate on inner face and bears at caudal angle a pair of minute clawlike hooks directed dorsad. Basal segment of left cercus (LC_1) bulbous apically, terminal segment short. Right cercus missing except for stump of basal segment.

Female.—Unknown.

Holotype.—Male, on slide, U.S.N.M. No. 56054.



FIGURES 121–123.—*Oligembia armata*, new species, holotype male (Trinidad): 121, Head; 122, terminalia (dorsal); 123, terminalia (ventral).

FIGURES 124–126.—*Oligembia armata*, specimen from Quintana Roo, Mexico: 124, Head; 125, terminalia (dorsal); 126, terminalia (ventral). Explanation of symbols on p. 403.

Type data.—Port of Spain, Trinidad, October 22–24, 1918 (“A 840”) (Harold Morrison).

These records suggest that *armata* is a widespread species, perhaps ranging throughout the lowlands bordering the Caribbean Sea.

Paratype.—Male, on slide, collected at light, St. Augustine, Trinidad, May 15, 1939 (E. McC. Callan): deposited in the British Museum of Natural History.

Additional specimens examined.—One male, at light, Juan Mina Station, Canal Zone, April 15, 1939 (G. Fairchild) (MCZ); one male, at light, Santa Cruz de Bravo, Terr. Quintana Roo, Mexico, August 18, 1925 (A. Dampf).

Remarks.—The Canal Zone specimen differs from the holotype only in its smaller echinulate nodule at base of 10 RP₁, in its slightly longer sclerotic tip of 10 RP₁, and in having only one "claw" on the inner lobe of LCB. The Quintana Roo specimen (see figs. 124–126) may prove to be at least subspecifically distinct when adequate series are available. It has a slightly different head form and a less acute and produced basal apodeme of the tenth tergite. The apparent differences in form of 10 LP, as indicated in the figures, may be due to the angle from which it was viewed.

DILOBOCERCA, new subgenus

Males with mandibles not curved ventrad at tips; teeth rather large, well defined. Terminalia with tenth tergite apodeme usually acutely produced well forward beneath ninth tergite; left tergal process (10 LP) rather broad, short, apex divided into two greatly dissimilar portions, the inner portion sclerotic, elongate, talonlike, the outer portion broad, spatuliform, thin, with margins irregular; right tergal process (10 RP₁) with outer margin usually sinuous; left paraproct (LPPT) usually broad, short, seldom longer than HP; left cercus-basipodite (LCB) with two inner lobes, the ventral one usually shorter and broadly pointed, the upper lobe elongate with a terminal cleft forming rather long "claws" which may at times be fused together; basal segment of left cercus (LC₁) usually clavate distad that of right cercus with inner margin often sclerotic and lobed distad; basal foramen of right cercus often dilated and complex in outline.

Type.—*Oligembia (Dilobocerca) lobata*, new species.

Distribution.—That of the genus *Oligembia*.

This is a very natural subgenus with species spread over a wide area, and it is apparent that only a small fraction of its species are known. The accompanying figures demonstrate the great similarity of general structure in the terminalia but species differences will be found in the form of the left tergal process and of the left cercus-basipodite. Supplementing these characters of the terminalia, important differences occur in size, color, and head form. In the two species studied in large series (*lobata* and *vandykei*) the characters described and figured are very constant.

Although the species are identified most readily by comparing figures and by using distributional data, the following key may be of additional value:

KEY TO SPECIES OF DILOBOCERCA (MALES)¹²

1. Left cercus-basipodite (LCB) with ventral lobe short, shorter than dorsal lobe; fleshy or broadly pointed..... 2.
 LCB with ventral lobe longer than dorsal lobe; fingerlike or acutely pointed 10
2. LCB with dorsal lobe tapered to a sharp point, uneleft; British Guiana
 intricata
 LCB with dorsal lobe bearing a pair of distal "claws"..... 3
3. LCB with ventral lobe fleshy, membranous, rounded; Tres Marias Islands, Mexico
 pacifica
 LCB with ventral lobe sclerotized (at least ventrally), broadly pointed... 4
4. Left tergal process (10 LP) with outer margin deeply notched just behind apex; basal segment of right cercus strongly, acutely lobed inward at apex; Oaxaca, Mexico.....
 emarginata
 10 LP with outer margin straight, not notched; basal segment of right cercus only obtusely rounded distad, if at all lobed..... 5
5. Northern South America..... 6
 Guatemala northward..... 7
6. Head narrow, parallel-sided; eyes small, scarcely inflated; submentum as long as broad, sides strongly arcuate; color black; Venezuela.....
 nigrina
 Head with sides rather strongly convergent; eyes large, strongly inflated; submentum longer than broad, sides weakly arcuate; color brown; Venezuela
 gigantea
7. Basal foramen of right cercus with ventral margin obtusely angulate; Guatemala.....
 excisa
 Basal foramen of right cercus with ventral margin acutely angulate..... 8
8. Eyes small, scarcely inflated, interspace more than two eye widths wide; Brownsville, Tex.....
 lobata
 Eyes large, strongly inflated, interspace only one eye width wide..... 9
9. 10 LP with apical margin of outer portion bi-emarginated, acutely pointed medially; Veracruz, Mexico.....
 jalapae
 10 LP not as above; Chiapas, Mexico.....
 chiapae
10. Ventral lobe of LCB fingerlike in form, rounded distally; southern Brazil.....
 plaumanni
 Ventral lobe of LCB narrowly conical in form, sharply pointed distally.... 11
11. Right mandible with a medial tooth on inner margin; southeastern United States
 vandykei
 Right mandible without such a tooth; Cuba.....
 caribbeana

OLIGEMBIA (DILOBOCERCA) LOBATA, new species

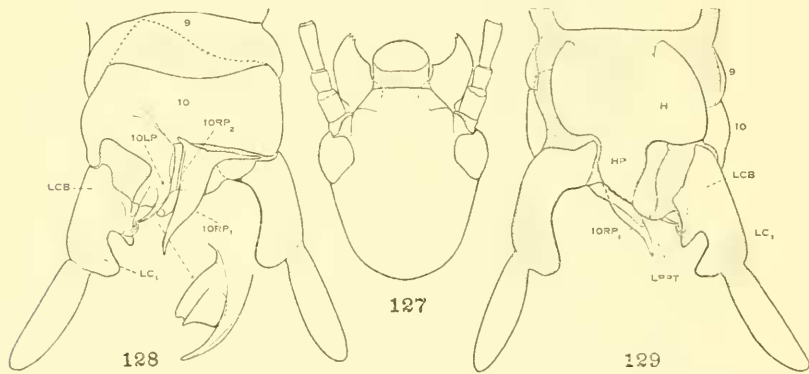
FIGURES 127-129

Male (in alcohol).—Sclerites smoky brown, intersclerotol membranes pale tan. Head and antennae black; mandibles amber yellow.

¹² *O. oligotomoides* (Enderlein) is not included, as, in the light of present knowledge, it is unrecognizable.

Abdominal terminalia with tenth tergite, right processes, and inner margins of cerci smoky black; left tergal process amber yellow. Body length 6.5 mm.; forewing length 4.4 mm., breadth 0.9 mm.

Head (fig. 127) elongate-oval; eyes medium sized, somewhat inflated; facets prominent, not outlined by pigmented interspaces; distance between eyes equal to two and one-half eye widths; sides behind eyes one and one-half eye lengths long, rather strongly convergent, evenly curved and united with the arcuate caudal margin. Occipital foramen as long as wide, somewhat acutely rounded anteriorly. Gular bridge as wide as submentum length. Submentum longer than wide; sides evenly arcuate, apical angles acute; anterior margin deeply emarginated. Mandibles not curved ventrad at tips, apical teeth small but distinct.



FIGURES 127-129.—*Oligembia lobata*, new species, holotype male (Texas): 127, Head; 128, terminalia (dorsal); 129, terminalia (ventral). Explanation of symbols on p. 403.

Wings large, broad, extending beyond tip of abdomen; medium brown, hyaline stripes well defined. Eight cross veins present between R_1 and costa in forewing, five in hindwing; three or four cross veins between R_1 and R_{2+3} in forewing, three in hindwing. R_1 united at apex by a cross vein to R_{2+3} , bordered throughout its length by reddish, granular lines. R_{2+3} represented by a pigmented vein throughout, forked just beyond basal third in both wings; R_{4+5} forked at basal third in both wings.

Terminalia (figs. 128, 129) with tenth tergite (10) very long on left side, produced basad beneath ninth tergite to its basal margin. Left process (10 LP) well developed, inner "talon" evenly arcuate, continuous with inner margin, sharp; outer spatulate portion broad, truncate apically, with a fine longitudinal carina to left of middle terminating as a minute point on apical margin. Right process (10 RP_1) with inner margin nearly straight, outer margin sinuate, apex

sharply pointed; inner process ($10 RP_2$) narrow, half as long as $10 RP_1$. Ninth sternite (H) pigmented at lateral thirds only, submembranous medially, quadrate, sides arcuate; process (HP) broad, prominent, parallel-sided, right side shorter than left, apical margin diagonal. Left paraproct (LPPT) large, well pigmented, longer than HP, fused along entire inner side to H and HP; apex acuminate, terminating as a small projection. Left cercus-basipodite (LCB) very large, greatly extended ventrad, bilobed mesad—the ventral lobe very dark, stout, acute; the upper projection sclerotic, directed dorsad, furcate from near base, the furcations closely paralleled. Basal segment of left cercus (LC_1) continuous with LCB, cylindrical basally but very abruptly produced inward as a large lobe apically; inner margin darkly pigmented; outer apical angle membranous. Terminal segment of left cercus large, cylindrical, gradually tapered, rounded distally. Basal segment of right cercus complex; basal foramen irregular, margin greatly produced ventrally; inner margin dark, very deeply emarginated, apex lobed internally; outer apical third membranous. Terminal segment of right cercus similar to that of left.

Female (in alcohol).—Pale brown throughout, intersclerotol membranes light straw yellow; head amber yellow with dorsal pattern prominent; antennae, except the two basal segments, chocolate brown. Length 5.0 mm.

Head and hind basitarsi similar to *melanura*.

Abdominal sternites: Seventh sternite faintly pigmented, lateral darker areas apparent but not prominent; eighth sternite without more strongly pigmented lateral areas; ninth sternite broadly, transversely emarginated as in *melanura*.

The female of *lobata*, though of a different subgenus, is structurally scarcely separable from *melanura*. This is additional evidence that females of the order are of little value in systematics.

Holotype.—Male, on slide (U.S.N.M. No. 56585), collected at Palm Grove, near Brownsville, Tex., September 29, 1942, and *allotype*, female, on slide, collected within the city limits of Brownsville, Tex., September 28, 1942; both collected by the writer.

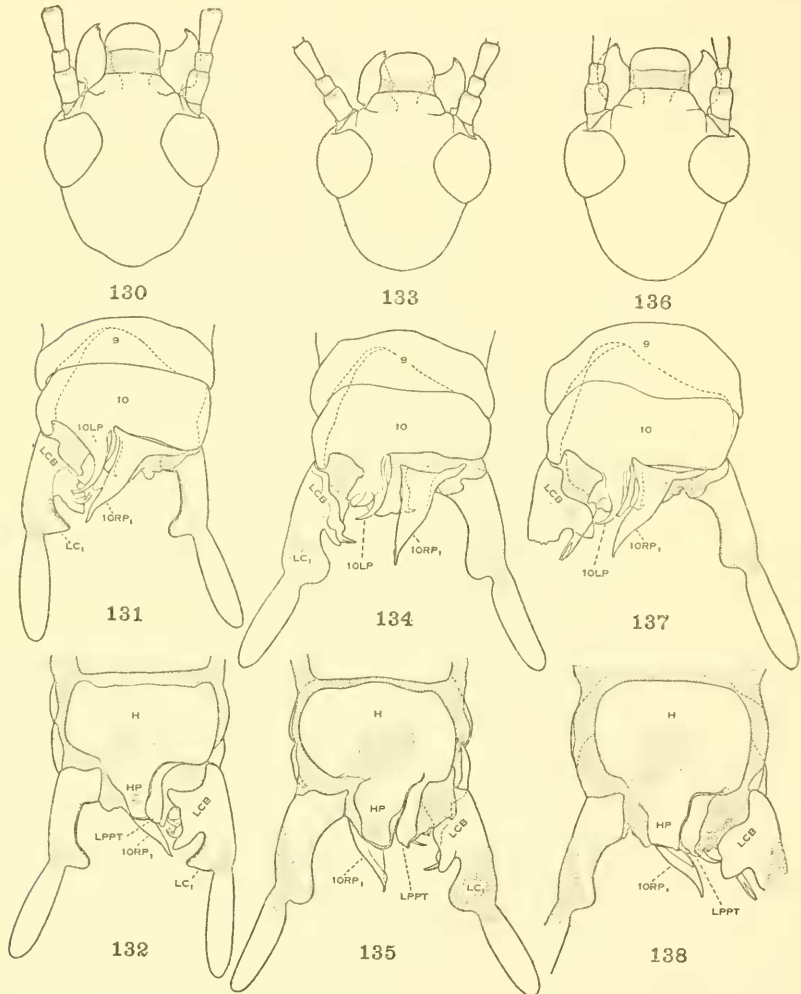
Paratypes.—Numerous males and females with above data, deposited in the California Academy of Sciences, the Museum of Comparative Zoology, and the writer's collection.

The type specimens, with young and eggs, were collected in small colonies on the bark of trees and under the flaky thin bark of dead limbs and trunks. In the latter situations the abandoned burrows of boring insects are apparently used as retreats from excessive heat and predators.

OLIGEMBIJA (DILOBOCERCA) JALAPAE, new species

FIGURES 130-138

This species is very similar to *chiapae* described below. It is quite possible that the study of more specimens will indicate that they are subspecies. Because of this similarity only a comparative description is given, as follows:



FIGURES 130-132.—*Oligembija emarginata*, new species, holotype male (Oaxaca, Mexico): 130, Head; 131, terminalia (dorsal); 132, terminalia (ventral).

FIGURES 133-135.—*Oligembija chiapae*, new species, holotype male (Chiapas, Mexico): 133, Head; 134, terminalia (dorsal); 135, terminalia (ventral).

FIGURES 136-138. *Oligembija jalapae*, new species, holotype male (Veracruz): 136, Head; 137, terminalia (dorsal); 138, terminalia (ventral). Explanation of symbols on p. 403.

Male.—Color (on slide): Similar to *chiapae*. Length 7 mm.; forewing length 5.7 mm., breadth 1.4 mm.

Head (fig. 136) as illustrated. Wings: R_{4+5} forked in basal third instead of basal fourth as in *chiapae*. Terminalia (figs. 137, 138) differing from *chiapae* as follows: Talonlike portion of left tergal process (10 LP) broader; outer broad portion only half as long as the "talon" instead of nearly equal, its apical margin transverse, biemarginate. Left cercus-basipodite with "claws" separate (not fused), directed caudad instead of mesad.

Female.—Unknown.

Holotype.—Male, on slide (U.S.N.M. No. 56761).

Type data.—Collected at light, Río Santiago (1,400 m.), Jalapa, Veracruz, Mexico, August 11, 1932 (R. Ruiz Sota).

Remarks.—The holotype specimen has most of the left cercus missing, but it is safe to assume that this appendage is similar to that of *chiapae* in view of the very close relationship of the two species. The holotype, as well as that of *chiapae*, was kindly sent to me for study by Dr. Alfons Dampf, of Mexico City.

OLIGEMBIA (DILOBOCERCA) CHIAPAE, new species

FIGURES 133–135

Male.—Color (on slide): Head, mouthparts, antennae, and inner margin of basal segment of right cercus chocolate brown; remainder of specimen tan, terminalia slightly darker. Length 6.5 mm.; forewing length 5.0 mm., breadth 1.3 mm.

Head (fig. 133) as illustrated.

Wings with R_{4+5} forked at basal fourth in forewings and hindwings.

Terminalia (figs. 134, 135) with basal projection of tenth tergite rounded, extending to basal third of ninth tergite. Left tergal process (10 LP) not strongly tilted; talonlike inner portion rather broad basally, only slightly longer than broad outer portion; outer portion abruptly emarginated basally on left side, apical margin with a single emargination to left of median projection which is blunt, margin to right of this projection simple, gradually slanting basad; cleft between inner and outer portions of 10 LP broad. Right tergal processes (10 RP_1 and 10 RP_2) simple, the major process very sharply pointed. Paraproct (LPPT) similar to *emarginata*. Left cercus-basipodite (LCB) with "claws" sclerotic, fused, directed dorsomesad; ventral lobe simple. Basal segment of left cercus (LC_1) strongly, broadly lobed apically on inner side; outer apical angle extensively membranous. Basal segment of right cercus with inner margin evenly, inwardly arcuate—this margin darkly pigmented; outer apical angle extensively membranous. Terminal segments of both cerci equal.

Female.—Unknown.

Holotype.—Male, on slide (U.S.N.M. No. 56762).

Type data.—Collected at light, Vergel, Chiapas, Mexico, May 20, 1935 (A. Dampf).

The holotype specimen has the right processes of the tenth tergite slightly dislocated owing to mounting technique. These structures are shown in their normal position in the figures of the other species of the subgenus.

OLIGEMBA (DILOBOCERCA) EXCISA, new species

FIGURES 139-141

Male.—Color (in alcohol): Head dark chocolate brown, basal pattern obsolete; eyes almost black; antennae with basal segment dark brown, other segments much lighter brown to tan. Thorax with sclerotized portions light brown, membranous areas pale. Wings faintly pigmented, tan. Forelegs light brown, middle legs and hind-legs light tan. Abdomen with all segments light tan except ninth sternite and tenth tergite which are brown; basal segments of cerci brown, terminal segments light tan. Length 5 mm.; forewing length 4.7 mm., breadth 1.2 mm.

Head (fig. 139) larger than terminalia, elongate; sides behind eyes strongly caudally convergent, nearly straight, narrowly rounded posteriorly. Eyes very large, strongly inflated, extending mesad one-third of width of head through eyes; inner margins irregularly, obtusely angulate; facets prominent. Antennae incomplete; maximum number of segments present, 16.

Wings much as in *brevicauda* but slenderer and with R_{4+5} forking well within basal half in both wings.

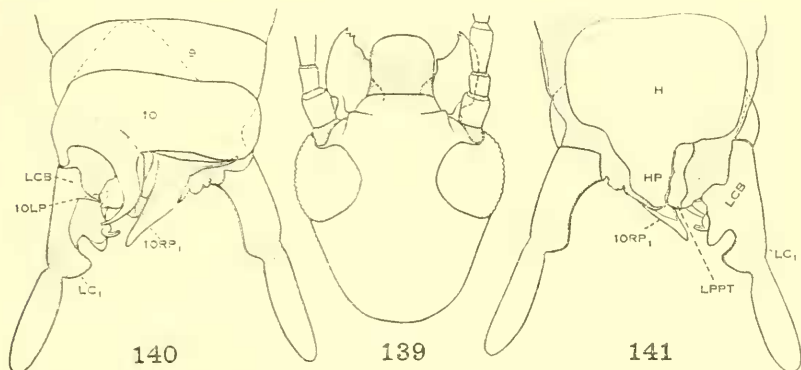
Terminalia (figs. 140, 141): Tenth tergite (10) produced forward beneath ninth tergite and terminating at its basal margin, not produced on right basal half. Left tergal process (10 LP) broad basally, continuous with tenth tergite; divided terminally, forming two dissimilar projections: the outer broad, quadrate, with apical margin to left of middle produced as a small sharp point; the inner projection narrow, very acutely pointed, talonlike, evenly curved toward basal segment of left cercus. Right tergal process (10 RP_1) fleshy, V-shaped, abruptly curved inward on outer margin. Ninth sternite (H) broad, quadrate; produced caudad as submedial, broad, truncate process (HP). Left paraproct (LPPT) loosely fused to right side of HP, longitudinal, emarginated on outer side and acutely pointed terminally. Left cercus-basipodite (LCB) with a short, inner, basal clawlike process, the "claws" arising almost without a basal projection; terminal to these, a short, blunt, sclerotic process is present; area be-

tween latter and the terminal sclerotized inner lobe of LC_1 deeply notched, partially membranous. Basal segment of right cercus large, inner margin evenly emarginated and strongly sclerotized. Terminal segments of both cerci similar.

Female.—No specimens.

Holotype.—Male, mounted on two slides, U.S.N.M. No. 56048.

Type data.—Intercepted in plant quarantine at San Francisco, Calif., April 25, 1938. Associated with 50 plants of *Stanhopea wardianum* shipped from Guatemala City, Guatemala.



FIGURES 139-141.—*Oligembia excisa*, new species, holotype male (Guatemala): 139, Head; 140, terminalia (dorsal); 141, terminalia (ventral). Explanation of symbols on p. 403.

OLIGEMBIA (DILOBOCERCA) EMARGINATA, new species

FIGURES 130-132

Male.—Color (on slide): Head, submentum, basal antennal segments, and inner margins of cerci chocolate brown; mandibles and apices of processes of tenth abdominal tergite golden brown; remainder of body light brown, terminalia darker. Length 5.7 mm.; forewing length 4.0 mm., breadth 0.9 mm.

Head (fig. 130) as illustrated.

Wings: R_{4+5} forked at basal third in left forewing and medially in left hindwing. Hyaline intervenal bands very broad anterior to M; behind M narrow.

Terminalia (figs. 131, 132) with tenth tergite elongated, basal projection obtuse, extending beneath ninth tergite and almost attaining its base. Left tergal process (10 LP) strongly tilted, outer margin lowest; inner portion strongly, outwardly curved (talonlike) overlapping LCB; outer, broad portion spatuliform, thin, its outer edge with a hemihexagonal apical notch, apical margin simple. Right tergal processes (10 RP_1 and 10 RP_2) simple. Hypandrium process (HP)

and left paraproct (LPPT) well defined, nearly equal in length. Left cercus-basipodite (LCB) with prominent inner dorsal "claws" projecting forward between 10 LP and 10 RP₁; ventral lobe simple. Basal segment of left cercus (LC₁) strongly, acutely lobed subapically, this lobe equal in length to inner lobes of LCB; darkly pigmented. Basal segment of right cercus deeply, abruptly emarginated, produced subapically as a large, blunt inner lobe. Terminal segments of both cerci simple, equal.

Female.—Color (on slide): Head straw yellow, antennae, mesothoracic, metathoracic, and abdominal sclerites light brown; prothorax and legs tan. Length 7 mm. Head broadly oval, occipital foramen broadly rounded anteriorly, as well as at posterior angles. Eighth sternite of abdomen pigmented at sides only, extensively membranous medially. Ninth sternite rather strongly pigmented basally, membranous along apical margin; very broadly, shallowly emarginated at base.

Holotype.—Male, on slide, U.S.N.M. No. 56047.

Type data.—Collected on pineapples from Loma Bonita, Oaxaca, Mexico, in plant quarantine at Nuevo Laredo, Mexico, June 12 1941 (H. R. Cary).

Allotype.—Female, on slide, U.S.N.M. No. 56047, with same data but collected on June 6, 1941, by V. L. Pearson.

Topotype.—Male, on slide, in the writer's collection. Condition too poor to permit paratype designation.

OLIGEMBIA (DILOBOCERCA) PACIFICA Ross

Oligembia pacifica Ross, 1940b, p. 640, figs. 11–13.

Holotype.—Male, on slide, in California Academy of Sciences, (type No. 4933).

Type data.—Magdalena Island, Tres Mariás Islands, Mexico, May 19, 1925 (H. H. Keifer).

OLIGEMBIA (DILOBOCERCA) INTRICATA Davis

Oligembia intricata DAVIS, 1942, p. 117, figs. 11–15.

Holotype.—Made, on slide, to be deposited in the British Museum of Natural History.

Type data.—"British Guiana, mile 18, Bartica-Partaro road," April 10, 1938 (E. McC. Callan).

Remarks.—Although a comparison of figures of terminalia of this species with those of the two Venezuela species described below might suggest a great similarity, the three species are quite distinct. They may be separated by their size and color as well as by the form of the head and processes of the terminalia.

OLIGEMMBIA (DILOBOCERCA) GIGANTEA, new species

PLATE 19A; FIGURES 145-147

Male.—Color (on slide): Body and legs light brown, wings lighter; head medium brown; mandibles reddish brown; basal two, and terminal, antennal segments brown, segments 3 to 5 straw yellow. Length 8 mm.; forewing length 5.8 mm., breadth 1.5 mm.

Head (fig. 145) with eyes moderately large, strongly inflated, convex, separated by a space one and one-half eye widths wide; facets moderately prominent. Head elongated behind eyes, sides nearly straight, convergent; caudal margin gradually rounded laterally, rather abruptly rounded medially. Mandibles with small, blunt, apical teeth; inner median points prominent, lying just before deep emarginations.

Wings (fig. 3) well pigmented. Five cross veins present between R_1 and R_{2+3} in forewing and six inconspicuous ones located apically between costal margin and R_1 ; hindwing with similar number but located more toward base and more widely spaced. Hyaline lines rather sharply defined.

Terminalia (figs. 146, 147) with basal projection of tenth tergite (10) reaching beneath ninth tergite (9) to the basal margin; apex of projection evenly rounded. Left tergal process (10 LP) broad, deeply cleft apically, the outer lobe short, spatuliform, the inner lobe slender, evenly, outwardly arcuate, talonlike. Right tergal process (10 RP_1) with extreme apex blunt. Ninth sternite (H) with process (HP) well pigmented, broad, truncate, half as long as 10 RP_1 . Left paraproct (LPPT) conspicuous, fused along inner margin with HP and of equal length. Left cercus-basipodite (LCB) well sclerotized, without membranous areas; inner projection bilobed, the large ventral lobe, gradually tapered, rounded apically, the dorsal projection slender, evenly curved, apically cleft, forming two nearly fused "claws" with a small, rounded, inner lobe present at its base. Basal segment of left cercus (LC_1) continuous with LCB; bearing a prominent, rounded, apical, inner lobe. Basal segment of right cercus with basal foramen complexly, irregularly outlined; inner margin emarginated and lobed apically, strongly pigmented. Terminal segments of both cerci equal, slender, cylindrical.

Female.—Unknown.

Holotype.—Winged male, on slide, U.S.N.M. No. 56051.

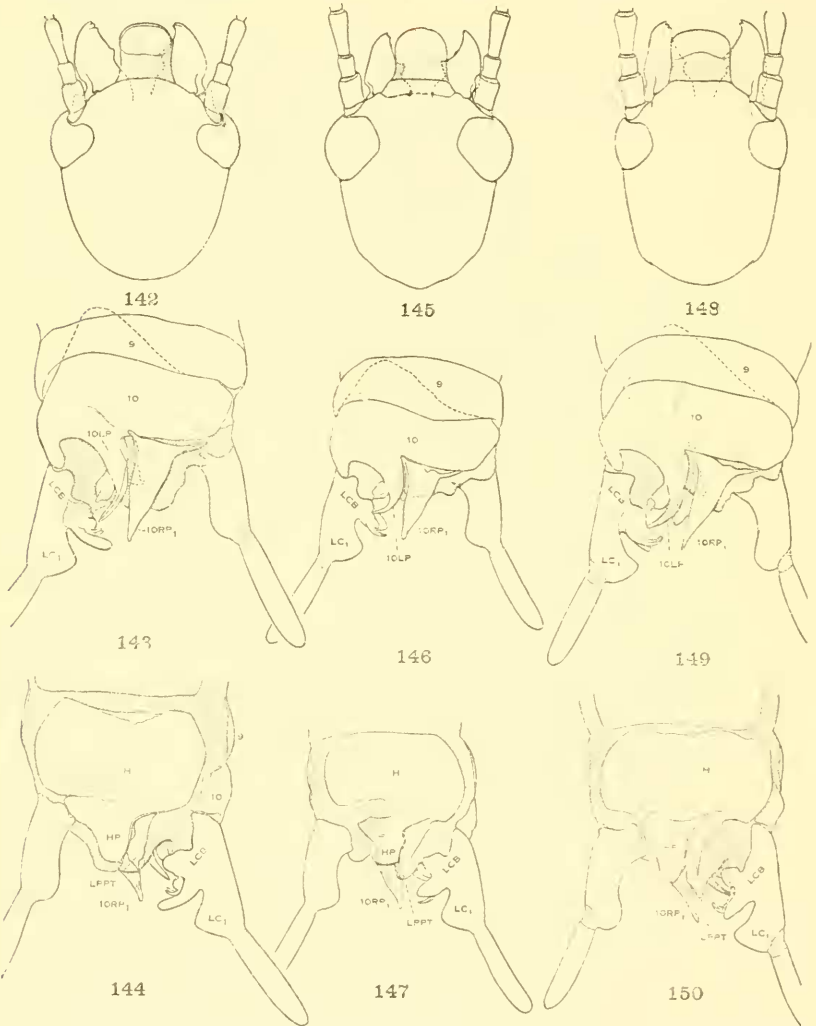
Type data.—"With wild *Cattleya* from Caracas, Venezuela," collected in plant quarantine at Washington, D. C., May 31, 1939 (Adams).

Paratype.—Male, on slide, with type data but collected on May 4, 1939; deposited in writer's collection.

OLIGEMBIA (DILOBOCERCA) NIGRINA, new species

FIGURES 148-150

Male (on slide).—Head behind eyes, antennae, body, legs, and terminalia (except 10 LP) very dark chocolate brown, nearly black; mandibles and clypeal region of head light reddish brown; submentum



FIGURES 142-144.—*Oligembia plaumanni*, new species, holotype male (southern Brazil): 142, Head; 143, terminalia (dorsal); 144, terminalia (ventral).

FIGURES 145-147.—*Oligembia gigantea*, new species, holotype male (Venezuela): 145, Head; 146, terminalia (dorsal); 147, terminalia (ventral).

FIGURES 148-150.—*Oligembia nigrina*, new species, holotype male (Venezuela): 148, Head; 149, terminalia (dorsal); 150, terminalia (ventral). Explanation of symbols on p. 403.

orange; 10 LP yellow. Length 7.5 mm.; forewing length 5.0 mm., breadth 1.2 mm.

Head (fig. 148) elongate, with eyes relatively small, not strongly inflated, separated by interspace equal to two and one-half eye widths; sides behind eyes two eye lengths long, scarcely convergent, subparallel, feebly arcuate; caudal margin abrupt, arcuate medially. Mandibles with apical teeth broad, blunt; inner medial angles very sharp, prominent.

Wings well pigmented; with four cross veins present between R_1 and R_{2+3} in forewing and seven between R_1 and costal margin; R_{2+3} , the only pigmented vein behind R_1 , nearly attaining terminus. Hindwing with two cross veins between R_1 and R_{2+3} and five between R_{2+3} and costal margin. R_1 very closely paralleling costa in both wings. Hyaline lines sharply defined, nearly equal in width throughout both wings.

Terminalia (figs. 149, 150) similar to *gigantea* but darker, with basal projection of tenth tergite more acute and extending partially beneath eighth tergite; left tergal process (10 LP) broader and with minor differences in form; right tergal process (10 RP_1) narrower, longer and more sharply pointed apically. Process of hypandrium (HP) and left paraproct (LPPT) longer and narrower, the latter longer than HP rather than subequal as in *gigantea*. Left cercus-basipodite (LCB) with ventral inner lobe narrower, shape irregular; dorsal lobe with "claws" distinctly separated, its basal lobe large, but not clearly delimited. Inner margin of basal segment of left cercus (LC_1) more deeply emarginated, apical inner lobe acute. Inner margin of right cercus also more deeply emarginated.

Female.—Unknown.

Holotype.—Male, on slide U.S.N.M. No. 56050.

Type data.—Collected at Hoboken, N. J., March 28, 1941, in plant quarantine by Inspector Sanford in a cargo case of *Cattleya* shipped from Caracas, Venezuela.

OLIGEMBIA (DILOBOCERCA) FLAUMANNI, new species

FIGURES 142-144

Male.—Color (in alcohol): Body and legs uniformly reddish brown; mid and hind tarsi and basal half of antennae tan; head amber yellow basad, darker in clypeal region. Length 7.1 mm.; forewing length 4.5 mm., breadth 1.2 mm.

Head (fig. 142) larger than terminalia; eyes rather small, short, rather strongly inflated; eye interspace broad, two and one-half eye widths wide; head outline behind eyes elongate-oval, sides strongly convergent, feebly arcuate, evenly rounded behind. Submentum

reddish brown, quadrate, sides arcuate, anterior angles rounded, apical margin shallowly emarginated. Mandibles with the apical dentations broad, blunt.

Wings pale brown; Rs forked just within basal half in forewing, at basal third in hindwing; R_{4+5} forked at basal fourth in forewing and at basal fifth in hind. Five R_1 - R_{2+3} crossveins in forewing, four such veins in hindwing. Hyaline stripes broad.

Terminalia (figs. 143, 144) with basal projection of tenth tergite (10) extending just beyond base of ninth tergite, acute; left process (10 LP) straw yellow, inner "talon" not strongly curved but well separated from the thin outer portion, which is parallel-sided, acutely pointed apically with a central carina extending beyond margin; major right process (10 RP_1) large, dark brown, inner basal angle acutely produced, distal apex blunt, straight. Hypandrium (H) well developed. Sides equal, right apical angle membranous, this area extending mesobasad but diminishing; process (HP) broad basally but abruptly narrowed midway distad, apex truncate. Left paraproct (LPPT) fused to HP on inner side, elongate, acuminate apically. Left cercus-basipodite (LCB) greatly produced mesad; upper lobe sclerotic, terminated by a pair of stout "claws" on a bulbous base; ventral lobe finger-shaped, elongate, well sclerotized beneath, membranous above; foramen with one dorsal, and two ventral projections on margin. Basal segment of left cercus (LC_1) continuous with LCB; abruptly, strongly, conically lobed inward at apex. Basal segment of right cercus short, basal foramen with margin irregular. Terminal segments of both cerci elongate, simple, equal.

Female.—Unknown.

Holotype.—Male, on slide U.S.N.M. No. 56586.

Type data.—Nova Teutonia, Santa Catharina, Brazil (F. Plaumann).

Paratypes.—Two males with above data deposited in the California Academy of Sciences and in the writer's collection.

OLIGEMBI (DILOBOCERCA) VANDYKEI, new species

FIGURES 151-153

Male.—Color (alive): Head bicolorous, the anterior dorsal half and submentum yellowish orange, the posterior dorsal half and venter of head capsule medium brown; mandibles dark brown, becoming brown; antennae tan basally, becoming light brown distad. Thorax, wings, and legs largely light brown; abdomen tan with terminalia dark golden brown distally, inner margins reddish brown; palpi light brown, the cerci tan. Length 6.9 mm; forewing length 5.2 mm., breadth 1.5 mm.

Head (fig. 151, paratype) rather broad, eye interspace one and one-half eye widths wide, sides behind eyes one eye length long, weakly convergent, slightly arcuate; caudal margin broad, shallowly arcuate; eyes large, somewhat inflated, facets without pigmented interspaces; two prominent, reddish-brown lobes are present beneath antennal scape at outer base of mandibles. Mandibles with bases very large, greatly produced inward; inner medial angles abruptly angled; left mandible with three small dentations at inner apex, margin behind proximal tooth broadly, weakly arcuate; right mandible with two small, closely approximated apical teeth; inner margin with a characteristic tooth midway between proximal apical tooth and medial angle. Submentum narrow behind; sides divergent to apical third, thence parallel, apical angles strongly produced forward, rounded distally; anterior margin transverse, straight. Occipital foramen somewhat pointed anteriorly.

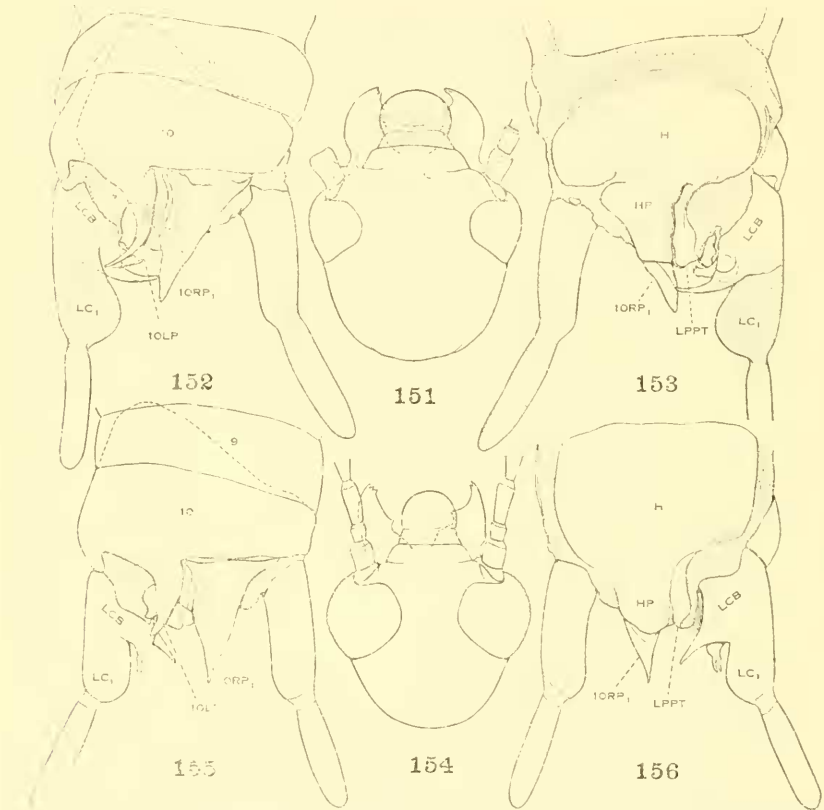
Wings large, broad, extending beyond tip of abdomen in living specimens. Venation without specific features. Forewing with seven C-R₁ cross veins in apical half, three R₁-R₂₊₃ cross veins and no others; hindwing with five C-R₁ and three R₁-R₂₊₃ cross veins.

Hind basitarsi elongate, with only the distal sole-bladder.

Terminalia (figs. 152, 153, paratype) with tenth tergite (10) acutely produced forward beneath ninth tergite nearly to its base, this projection weakly pigmented; exposed tergite without definite indications of sutures. Left process (10 LP) with a strong, evenly arcuate, talonlike projection continuous with inner margin; outer portion short, apical margin diagonal (from left to right), with a stout submedian projection. Major right process (10 RP₁) broad and unmodified basally, outer margin rather straight, inner margin sinuous; secondary right process (10 RP₂) darkly pigmented. Ninth sternite (H) with sides rounded, lateral areas pigmented but becoming broadly membranous medially; produced caudad as a broad process (HP), somewhat tapered but broadly truncate distally and "granulate" on left side. Left paraproct (LPPT) fused to side of HP, suture becoming somewhat expanded distad, apex pointed and notched subterminally on left side. Left cercus-basipodite (LCB) well pigmented, bilobed mesially; the dorsal lobe shortest, sclerotic, curved upward and cleft distally, forming two stout "claws"; ventral lobe sclerotic elongate, gradually tapered and slightly curved, projecting almost to central axis of body. Basal segment of left cercus (LC₁) weakly pigmented in basal half and along inner margin, membranous at outer apex, gradually swollen distad; terminal segment (LC₂) cylindrical, gradually tapered distad. Right cercus with basal segment dark, especially at base; very gradually tapered, unlobed at apex; terminal segment similar to that of left cercus.

Female.—Color (alive): Head reddish brown, antennae medium brown; remainder of body tan except mesothorax and metathorax, which are noticeably paler tan; cerci with terminal segment light brown. Body length 7.0 mm.

Head broad, circular, caudal margin evenly rounded, sides scarcely caudally convergent. Occipital foramen elongate, rounded anteriorly;



FIGURES 151–153.—*Oligembia vandykei*, new species, paratype male (Florida): 151, Head; 152, terminalia (dorsal); 153, terminalia (ventral).

FIGURES 154–156.—*Oligembia caribbeana*, new species, holotype male (Cuba): 154, Head; 155, terminalia (dorsal); 156, terminalia (ventral). Explanation of symbols on p. 403.

gular bridge narrow, only half as wide as submentum length. Body without apparent specific peculiarities. Hind basitarsus with 18 stout plantar bristles, with only the terminal sole-bladder, bladder of middle segment echinulate. Abdominal sternites very faintly pigmented; ninth sternite very broadly, shallowly, and transversely excised at base.

Holotype and allotype.—On slides (U.S.N.M. No. 56763).

Type data.—In bark, 5 miles northeast of Pensacola, Fla., on shores of Escambia Bay, February 9, 1943 (matured March 10) (E. S. Ross).

Paratypes.—Numerous males and females with above data; deposited in the Museum of Comparative Zoology, the California Academy of Sciences, and writer's collection. One male, St. Augustine, Fla., March 4, 1940. "beating vegetation" (E. C. Van Dyke) (CAS).

Additional records.—FLORIDA: Two males, Florida Fruit Fly Survey, Duval County, December 30, 1929 (L. L. Knight) (USNM); two males, Paradise Key, March 2, 1919 (H. S. Barber) (USNM). SOUTH CAROLINA: Several males and females, Sumter and vicinity, February 10, 1943 (E. S. Ross). (See also p. 499.)

Remarks.—This species is named for Dr. E. C. Van Dyke, who collected the first specimen to come before the writer.

O. (D.) vandykei is readily distinguished from other *Oligembias* by its medially toothed right mandible and the greatly produced, pointed ventral lobe of the left cercus-basipodite. It is apparently related to *caribbeana* of Cuba, which has a similar lobe but which has no medial tooth on the mandible. *O. hubbardi*, the only other known Florida *Oligembia*, is easily separated, by means of its single mesal lobe of the basipodite.

O. vandykei is apparently a widespread species, perhaps ranging throughout Florida, and along the Gulf shore at least as far as New Orleans, and up the Atlantic Coastal Plain probably as far as southeastern Virginia. In habits the species is identical to *melanura* of Texas, except that the colonies appear to occur mostly on the exposed sunny sides of isolated trees. At Pensacola, Fla., large numbers of colonies were found in the bark of live oaks, which had deeply grooved and extensively flaked bark. Few lichens were present. At Sumter, S. C., the colonies were abundant on the bark of both live and deciduous oaks. The tunnels were usually spun beneath lichens. In both localities the males were in the penultimate instar in early February perhaps indicating a cyclic development independent of seasons or geographic position.

An interesting case of predatism comparable to that of the Sclerogibbidae was noted at Pensacola. Numerous Embioptera were found dead in the tunnels in a soft, shriveled condition. Usually near such individuals small (3 mm.), pink fly larvae or pupae were found, the latter being enclosed in loose silken cocoons. Itonididae (formerly Cecidomyiidae) were reared from the pupae, which, according to C. T. Greene, appear to be either of the genus *Feltiella* Rübtsaamen or of *Lestodiplosis* Kieffer. This is the first record of Embioptera as hosts of these predatory fly larvae.

OLIGEMBIA (DILOBOCERCA) CARIBBEANA, new species

FIGURES 154-156

Malc.—Color (before staining): Body, legs, and wings very pale straw yellow; head tan. Length 5.5 mm.; forewing length 3.7 mm., breadth 0.9 mm.

Head (fig. 154) with eyes very large, inflated, interspace slightly less than an eye width; facets very large; head behind eyes very short, sides and caudal margin evenly, continuously arcuate. Mandibles broad basally, acutely tapered apically; apical teeth small, but very sharp. Submentum quadrate, all sides nearly straight; somewhat narrower basally.

Wings without special features. Four cross veins present between R_1 and R_{2+3} in forewing, the terminal of these uniting apex of R_1 with R_{2+3} ; three cross veins in this position in hindwing.

Terminalia (figs. 155, 156) with basal margin of tenth tergite (10) produced on left side beneath ninth tergite (9) to its basal margin. Left tergal process (10 LP) very stout, heavily sclerotized, bilobed; the outer lobe strongly arcuate on outer margin basally, the inner lobe fingerlike. Right tergal process (10 RP_1) with extreme tip abruptly narrowed, sclerotic, minutely truncate. 10 RP_2 , hypandrium (H), its process (HP), and left paraproct (LPPT) without noteworthy features. Left cercus-basipodite (LCB) prominent, inner side with two well-developed sclerotic processes—a very slender, simple, ventral process pointed toward tip of 10 RP_1 and a caudally directed dorsal process with a pair of large, terminal, clawlike hooks. Cerci pale; basal segment of left cercus (LC_1) stout, short, bulbous; basal segment of right cercus elongate, cylindrical.

Female.—Unknown.

Holotype.—Male, on slide (stained with acid-fuchsin), U.S.N.M. No. 56049.

Type data.—"On dead vines," Cayamas, Santa Clara, Cuba, March 11, 1911 (E. A. Schwarz).

OLIGEMBIA (DILOBOCERCA) OLIGOTOMOIDES (Enderlein)

Rhagadochir oligotomoides ENDERLEIN, 1912, p. 61, figs. 36-37, pl. 3L.

Embia oligotomoides (Enderlein) NAVÁS, 1918, p. 101.

Oligembia oligotomoides (Enderlein) DAVIS, 1939b, p. 222, fig. 21.

Holotype.—Male, Berliner Zoologischen Museum.

Type data.—South America.

Paratype.—Male, South America (Stettiner Zool. Mus.).

Remarks.—This species could be placed in the genus *Idioembia* on the strength of Enderlein's original description and figures, which

give no indication of the transverse suture at the base of 10 RP₁ and 10 RP₂. It is quite likely that this was overlooked by Enderlein, as the types were probably not cleared; thus the tentative placement of the species in this group will probably prove to be correct when the details of the holotype are made known.

Genus DIRADIUS Friederichs

Diradius FRIEDERICHS, 1934, p. 419.—DAVIS, 1940d, p. 528.

Genotype.—*Diradius pusillus* Friederichs.

Distribution.—Southern Brazil.

This genus, known to date by only the unique holotype of its single species, has tentatively been placed in the Oligembiidae by Davis on the basis of its embioid wing venation with reduction of vein strength comparable to *Oligembia* and the nonechinulate left cercus. More detailed information concerning the structure of the male terminalia may prove that the species is congeneric with those of the more recently named genus *Oligembia*, thus compelling the use of the name *Diradius* in its place. It will be best, however, to retain the present status of these species until carefully identified specimens of *pusillus* are available, or until its type is redescribed and refigured in a more fact-revealing manner.

DIRADIUS PUSILLUS Friederichs

Diradius pusillus FRIEDERICHS, 1934, p. 419, fig. 7a-d.—DAVIS, 1940d, p. 528, figs. 4-7 (after Friederichs).

Holotype.—Male, Hamburg Museum.

Type data.—"1 ♂, gesammelt von W. Ehrhardt bei dem Ort Isabelle in Bezirk Humboldt des Staates Santa Catharina in Brasilien."

Family TERATEMBIIDAE

TeratembIIDae KRAUSS, 1911, p. 33.—ENDERLEIN, 1912, p. 38.—NAVÁS, 1918, p. 107.—DAVIS, 1940e, p. 536; 1940f, p. 680.

Type genus.—*Teratembia* Krauss.

Distribution.—Argentina.

This family and its component genus and species are based upon a single specimen. The wing-venational character, R₂₊₃ forked and R₄₊₅ simple, is unparalleled in the order, and, if not anomalous, would perhaps justify the retention of this distinct family. Collectors in Argentina are urged to secure more specimens of this species so that this interesting venational character can be verified and the details of the male terminalia can be more clearly revealed.

Genus *TERATEMBIA* Krauss

Teratembia KRAUSS, 1911, p. 33.—ENDERLEIN, 1912, p. 98.—NAVÁS, 1918, p. 107.—DAVIS, 1940d, p. 529.

Genotype.—*Teratembia geniculata* Krauss.

Distribution.—Argentina.

TERATEMBIA GENICULATA Krauss

Teratembia geniculata KRAUSS, 1911, p. 33, pl. 1, figs. 3, 3A-G.—ENDERLEIN, 1912, p. 98, figs. 63, 64.—NAVÁS, 1918, p. 108.—DAVIS, 1940d, p. 529, figs. 8-13.

Holotype.—Male, deposited in the Budapest Museum.

Type data.—Tucumán, Argentina. January 15, 1906 (Vezenyi).

Family OLIGOTOMIDAE

[Complete list of references not given.]

Oligotomidae ENDERLEIN, 1909, p. 190.

Old World Embioptera (except *Gynembia*) spread by man to the New World. Males (when winged) with R_{4+5} of both wings simple; the mandibles with distinct apical dentations, three on the right and two on the left mandible; hind basitarsi with one of two sole-bladders; basal segment of the left cercus cylindrical and nonechinulate; major process of right hemitergite ($10 RP_1$) long, V-shaped; similar to that of *Oligembia*.

Type genus.—*Oligotoma* Westwood.

Distribution.—Warm regions of the world.

The two genera of this family found in the New World may be separated by means of the following key:

KEY TO GENERA OF OLIGOTOMIDAE

1. Parthenogenetic females with two hind basitarsal sole-bladders; restricted to California and Arizona.....*Gynembia*
Both sexes present; with only one basitarsal sole-bladder; widespread throughout warm regions of Americas.....*Oligotoma*

Genus OLIGOTOMA Westwood

[Complete list of references not given.]

Embia (*Oligotoma*) WESTWOOD, 1837, p. 373, figs.

Oligotoma Westwood, BURMEISTER, 1839, p. 770.

Aposthonia KRAUSS, 1911, p. 48 (genotype: *A. rossleri* Krauss).

Genotype.—*Embia* (*Oligotoma*) *saundersii* Westwood.

Distribution.—Endemic to North Africa, Asia Minor, Asia, East Indies, and Australia. Three species, spread by man to the New World, are frequently collected and are at times commoner than the native species of an area. They are more fully treated and are

figured in other papers (Ross, 1940b, pp. 667-675; Davis, 1939a, 1940c). The lengthy bibliography of each species is here reduced to include only the names applied to each species and certain essential references.

KEY TO AMERICAN SPECIES OF OLIGOTOMA (MALES)

1. Major process of right hemitergite (10 RP₁) with a small but distinct subapical tooth on outer margin.....humbertiana
Major process without such a tooth..... 2
2. Process of left hemitergite (10 LP) broad, only about twice as long as broad; sclerotic spine of hypandrium process long, slender, sickle-shaped, lying horizontal beneath process (HP).....saundersii
Process of left hemitergite slender about 5 times longer than broad; sclerotic spine of hypandrium process short, stout, hooklike; bent ventrad..... nigra

OLIGOTOMA SAUNDERSII (Westwood)

Embia (Oligotoma) saundersii WESTWOOD, 1837, p. 373, pl. 2, fig. 2.

Oligotoma saundersii (Westwood) BURMEISTER, 1839, p. 770.—DAVIS, 1939a, p. 181, figs. 1-4 (establishes identity).—ROSS, 1940b, p. 668, figs. 40, 42-44.

Embia latreillii RAMBUR, 1842, p. 312.

Oligotoma latreillei (Rambur) ENDERLEIN, 1910, p. 56.—DAVIS, 1939a, p. 183 (spelled *latreillii*).

Olyntha cubana HAGEN (*nomen nudum*), 1866, pp. 221, 222.

Oligotoma cubana HAGEN, 1885, p. 141.—DAVIS, 1939a, p. 183 (establishes synonymy).

Oligotoma insularis McLACHLAN, 1883, p. 227.

Embia bramina SAUSSURE, 1896b, p. 352.

Oligotoma bramina (Saussure) KRAUSS, 1911, p. 37, pl. 1, fig. 6.—DAVIS, 1939a, p. 184 (suggests synonymy).

Embia hova SAUSSURE, 1896b, p. 354.

Oligotoma hova (Saussure) KRAUSS, 1911, p. 38.

Oligotoma rochai NAVÁS, 1917, p. 281.—KRAUSS, 1917, p. 316 (establishes synonymy).

Oligotoma inaequalis BANKS, 1924, p. 421.—DAVIS, 1939a, p. 184 (establishes synonymy).

Holotype.—Winged male (carded; terminalia mounted on slide); Hope Department of Entomology, Oxford University.

Type data.—"East Ind." (India) (W. S. Saunders).

Distribution.—Artificially tropicopolitan. In New World widespread from Texas, Florida, West Indies, and Mexico to temperate South America. Found especially near cities and towns.

OLIGOTOMA NIGRA Hagen

Embia nigra HAGEN (*nomen nudum*), 1866, p. 221.

Oligotoma nigra HAGEN, 1885, p. 174.—DAVIS, 1940c, p. 363, fig. 1 (treats lectotype).—ROSS, 1940b, p. 670, figs. 3, 41, 45-47.

Embia californica BANKS, 1906, p. 1, pl.—DAVIS, 1940c, p. 364.—ROSS, 1940b, p. 673.

Oligotoma californica (Banks) BANKS, 1924, p. 421, fig. (in part).

Oligotoma saundersii of NEEDHAM, 1909, p. 193 (misidentification, see Ross, 1940b, p. 670).

Oligotoma mesopotamica ESEEN-PETERSEN, 1929, p. 8.—DAVIS, 1940c, p. 364.

Lectotype.—Winged male, carded, Museum of Comparative Zoology.

Type data.—Island of Rhoda, Cairo, Egypt.

General distribution.—Date-growing regions of Old and New World (where palms were introduced by cuttings, i. e., Southwestern United States).

OLIGOTOMA HUMBERTIANA (Saussure)

Embia humbertiana SAUSSURE, 1896b, p. 353.

Oligotoma humbertiana (Saussure) DAVIS, 1939a, p. 186, fig. 5.—Ross, 1940b, p. 674, figs. 48-50.

Oligotoma saundersii of KRAUSS, 1911, p. 39.—ET AL. (misidentifications).

Oligotoma californica of NAVÁS, 1923b, p. 31 (misidentification, see Davis, 1939a).

Holotype.—Male, Muséum d'Histoire Naturelle, Geneva.

Type data.—Ceylon.

Distribution.—Artificially tropicopolitan. In New World occurs sporadically from Mexico to temperate South America and is less frequently collected than *saundersii*.

Genus GYNEMBIA Ross

Gynembia Ross, 1940b, p. 664.

Genotype.—*Gynembia tarsalis* Ross.

Distribution.—California and Arizona.

GYNEMBIA TARSALIS Ross

Gynembia tarsalis Ross, 1940b, p. 664, figs. 4, 39.

Holotype.—Female, on slide, California Academy of Sciences (type No. 4934).

Type data.—Clayton, Contra Costa County, Calif., July 4, 1939 (E. S. Ross).

Distribution.—California, Arizona (one record).

Remarks.—This species is known only by parthenogenetic females, although many hundreds of individuals have been collected as well as reared through several generations in the laboratory. It is recognized at once by the fact that it is the only known North American species of the order possessing two basitarsal sole-bladders, as well as by its distribution.

At this time the writer is provisionally placing the genus and species in the family Oligotomidae because its general facies and

the chaetotaxy of the hindtarsi are almost identical to those of females of the oligotomid genus *Haploembia* of the Mediterranean region of the Old World. It is also interesting to note that *Gynembia* has habits identical to those reported for *Haploembia solieri* in Bulgaria (Táborský, 1938, as *grassii*). Fossils from Baltic amber (*Haploembia antiqua*) (Pictet) indicate that this genus ranged far to the north during Tertiary times, and it is possible that it extended eastward across Siberia as well. Thus it is suspected that the ancestors of *Gynembia* reached America at this time (as did so much Pacific coast biota) by means of the land bridge across the Bering Strait. With but this one exception, all other Embioptera that are present today in temperate North America can be directly derived from Neotropical ancestors. The possibility of its introduction by man from Europe must be considered, but such a happening seems unlikely in view of the wide distribution of the species in California and the fact that it is parthenogenetic, i. e., males are present in *Haploembia*.

UNRECOGNIZABLE SPECIES

The following four species are based upon specimens of the female sex or young and, in the light of present knowledge, are unrecognizable:

EMBIA (OLYNTHA) MULLERI Hagen

Embia (Olyntha) mulleri HAGEN, 1885, p. 206.—KRAUSS, 1911, p. 32.—ENDERLEIN, 1912, p. 52.—NAVÁS, 1918, p. 102.—DAVIS, 1940b, p. 352.

Holotype.—Female (dried and crushed), Museum of Comparative Zoology.

Type data.—"Itajahy, S. Cattarina, S. Brazil, collected 1879 by Dr. F. Muller."

This species is probably an *Embolynta*.

OLIGOTOMA BICINGILLATA Enderlein

Oligotoma bicingillata ENDERLEIN, 1909, p. 191.—KRAUSS, 1911, p. 45.—ENDERLEIN, 1912, p. 93, pl. 1R.—NAVÁS, 1918, p. 90.—DAVIS, 1940c, p. 384.

Holotype.—Female, in Stettiner Zoologischen Museum.

Type data.—"Brasilien, Para."

EMBIA PIQUETANA Navás

Embia piquetana NAVÁS, 1919, p. 25.—DAVIS, 1940b, p. 352.

Holotype.—Female, disposition unknown.

Type data.—Santa Fé, Argentina.

EMBIA KLUGI Rambur

Embia klugi RAMBUR, 1842, p. 313.—DAVIS, 1940b, p. 352 (*Embolynta* ?).

Holotype.—Male?

Type data.—Brazil (Delalande).

* * * * *

The following three species are based upon male holotypes that are inadequately described and perhaps lost; the recognition of these species must await redescription of their types if still preserved:

OLYNTA RUFICAPILLA Burmeister

Olynta ruficapilla BURMEISTER, 1839, p. 770.—WALKER, 1853, p. 532.—DAVIS, 1940b, p. 348.

Embia (Olynta) ruficapilla (Burmeister) HAGEN, 1885, p. 196 (male—no positive identification).

Embia ruficapilla, (Burmeister) ENDERLEIN, 1912, p. 49, figs. (male—misidentified ?).—NAVÁS, 1918, p. 97.

Holotype.—Male, in Muséum du Jardin des Plantes, Paris (*see* Hagen), or Halle? (*see* Davis).

Type data.—Brazil (Delalande).

EMBIA KOTZBAUERI Navás

Embia kotzbaueri NAVÁS, 1925, p. 67, fig. 2.

Holotype.—Male, in Spain (lost ?).

Type data.—Nichteroy, near Rio de Janeiro, Brazil.

CONDYLOPALAMA AGILIS Sundevall

Condylopalama agilis SUNDEVALL, 1847, p. 255.—KRAUSS, 1899, p. 148 (*Olynta*).—ENDERLEIN, 1912, p. 29 (*Embia*).

(?) *Olynta agilis* (Sundevall) KRAUSS, 1911, p. 32.

Holotype.—Location unknown.

Type data.—Brazil ?

ADDENDA

The following records came to hand too late for incorporation in the body of this report:

Chelicerca (Dactylocerca) rubra (Ross) (see p. 454)

Additional record.—Fillmore, Utah, June 10, 1943. Two males collected by sweeping grass (G. F. Knowlton). Identified by H. K. Townes and not seen by the writer. This is the first record of the order from the State of Utah and the most northern record of the species.

Oligembia (Oligembia) melanura Ross (see p. 470)

Additional record.—New Orleans, La. (E. S. Ross), common on bark of live-oak trees in parks and bordering streets. Mature males present late in September and early in October. This represents a considerable extension of the known range of the species and indicates that it may occur throughout the Gulf Coastal Plain of Texas and Louisiana.

Oligembia (Dilobocerca) vandykei Ross (see p. 488)

Additional records.—FLORIDA: Jacksonville (Oriental Gardens), October 14, 1943; Jacksonville Beach, October 15, 1943; Palatka, October 15, 1943; Gainesville, October 16, 1943; Old Town, Dixie County, October 16, 1943; Tallahassee, October 18, 1943; St. Marks, Wakulla County, October 20, 1943. MISSISSIPPI: Pass Christian, September 20, 1943. LOUISIANA: Slidell, September 20, 1943. All collected by the writer. This widespread species is most common on the bark of live oak but is found also on cabbage-palm trunks and in the bark of juniper and baldcypress. Thus far the species has not been collected west of the Mississippi River.

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